Precihite

Height Measuring Instrument

User's Manual

Introduction:

The Precihite is a high accuracy height-measuring instrument. The instrument is available in two different accuracy models (with variable measuring height). Please read the specifications for more details.

- Precihite Ultra (450mm, 600mm, 1000mm)
- Precihite Magna (450mm, 600mm, 1000mm)

The Precihite, height-measuring instrument consist of measuring column and controller unit, EL100.

The instrument is suitable for One-Dimensional as well as Two-Dimensional measurements.

Specially designed body cover reduces dust particles entering inside the measuring column assembly.

Specified operating temperature for Precihite is 10°C to 40°C. However, it is recommended that the best accuracy results are achieved at 20°C as the master slip sizes are defined at that temperature.

High quality, hardened and lapped stainless steel air bearing pads with built in air compressor provides smooth movement of the instrument on granite surface plate.

Standard measuring probe is Ø6 mm X 48 mm long with Ruby ball.

Two jog keys provide rapid motorized movement of the yoke between two measuring points. These jog keys help to move the yoke up and down for non-measuring activities. The yoke can also be moved manually by hand. The jog keys help the user to reduce the idle measuring cycle time.

CAUTION: - DO NOT USE THE JOG KEYS FOR MEASUREMENT. THIS MIGHT DAMAGE THE PROBE.

Controller unit is provided with an adjustable joint to adjust the angle of controller unit according to the operator's requirement.

A handle with cushioning grip is provided to hold and move the instrument comfortably. Maximum care is taken during design of the instrument for ease of operations.

Actual measurement is carried out at the constant measuring force of 1N. The tolerance maintained here is +/- 0.2 N.

The instrument operates on a re-chargeable battery. AC adaptor is provided for its charging. Charging time is approximately 4 hours and depends on the initial battery charge. Battery life is approximately 8 hours. It can also operate on AC adaptor independently without battery.

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1. Safety Measures:

Please read the following instructions carefully to avoid any damage due to improper handling of the instrument.

Manufacturer will not be responsible for any damages caused due to improper handling of the Instrument or if the instructions are not followed as mentioned in the manual.

- Instrument should be switched ON only after completing all electrical connections and mechanical installations.
- To get consistent performance of the instrument, do not dismantle or dis-assemble any assembled part of the machine.
- Do not expose the instrument, its components and accessories to water or any other fluids. Protect the instrument from foreign materials to penetrate inside the connectors and small openings.
- Do not open Digital controller EL 100.
- If in case of operational failures in the instrument or any of its part (no display, over-heating, odd smell, etc) is observed, switch off the instrument immediately and disconnect the power supply. Contact your local Precihite dealer for trouble-shooting.
- This is a high accuracy machine. To get consistent performance it is important to take particular care at the times with handling.
- Instrument should be operated on Grade Zero, smooth & clean Granite surface plate.
- Avoid shock to prevent the characteristics features of the instrument from losing its performance.
- Operate the instrument in a vibration free zone.
- Avoid direct contact with sunlight and excessive humidity.
- Avoid over heating or over cooling of the machine.
- Respect the indicated environmental conditions.
- Clean air pads (See section 3.1) periodically to remove foreign particles in between surface plate and machine air pads.
- *DO NOT USE THE INSTRUMENT FOR MARKING OR SCRIBING*.
- Only use probes supplied by the manufacturer or dealer manufactured for Precihite. Using locally made probes gives an additional stress on the measuring column and will damage the instrument.

2. Standard Scope of Supply

Sr. No.	Description	Quantity
1	Main Instrument	1
2	Digital controller EL 100	1
3	AC Adaptor	1
4	Power supply cable	1
5	Probe Ø6 mm X 48 mm	1
6	Setting Master	1
7	Dust protection cover	1
8	Allen key set	1
9	Allen Set for M8 screws	2
10	User Manual	1
11	Probe holder assembly	1
12	Base handle assembly	1
13	Data transfer cable USB	1
14	Data transfer software CD	1
15	Calibration Report	1
16	Magnascan with holder (Optional for selected models)	1

- While removing the instrument for un-packing, hold the instrument by base handle and the column cover only.
- If the instrument has been stored at a temperature below 10°C, wait a few hours before unpacking to prevent the instrument parts from humidity condensation. Condensation can affect sensitive parts (like electronic components) of the instrument. During packing special water-absorbent packets are used to protect the instrument from condensation. Condensation might lead to corrosion and can damage the instrument.

Precihite Product Codes:

Type	Length	Code
Precihite Ultra	450	HEMM-PU-0450
	600	HEMM-PU-0600
	1000	HEMM-PU-1000
Precihite Magna	450	HEMM-PM-0450
	600	HEMM-PM-0600
	1000	HEMM-PM-1000

3. Installation and Commissioning:

3.1 Clean the surface plate with clean fabric slightly soaked with alcohol or propane.

3.2 To wipe the dust on DRO use cloth only. Do not use alcohol or any other washing material.

3.3 Remove plastic caps from air cushion pads provided at the bottom of the instrument and clean the air cushion pad surface. See 3.1.

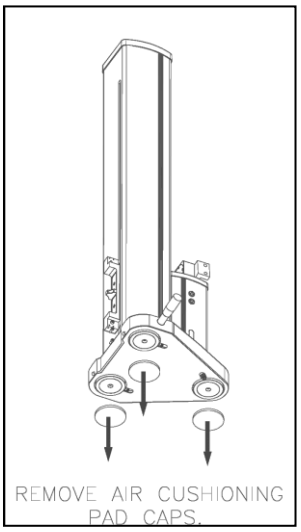


Fig. 1

3.4 Position the instrument on the surface plate with proper care.

3.5 Release the transport lock: A small opening is provided at the top of the main cover cap to unlock the instrument. Remove the rubber grommet and insert 5mm Allen-key (supplied) and un-lock the screw (M6).

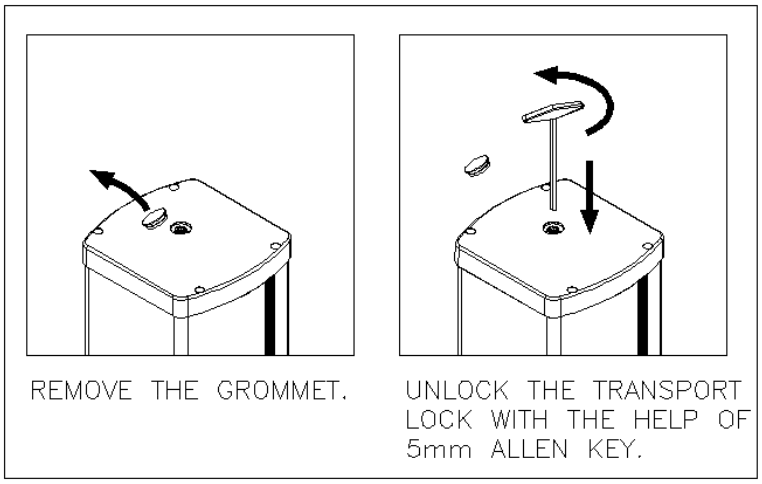


Fig. 2

CAUTION: - DO NOT REMOVE THIS SCREW AS IT MIGHT FALL INSIDE THE MACHINE.

3.6 Position the square probe holder assembly along with probe as shown in Fig.3. Confirm the probe touches the surface plate manually by hand.

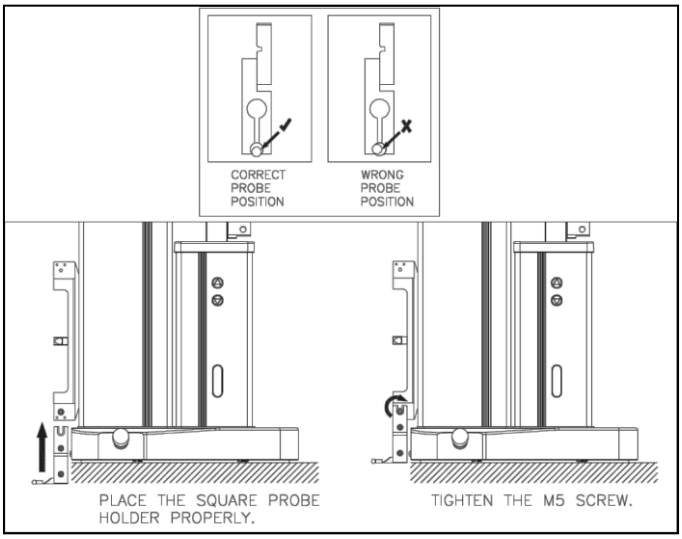


Fig. 3

3.7 Mount digital controller EL100 with the help of two M8 CSK screws supplied (Use 5mm Allen-key). Avoid direct contact with the connector pins to avoid damage to the electronic components due to Electro Static Discharge ( ).

3.8 Keep digital controller in switched off condition and then Connect Z (M) connector to Z (F) connector and connect interface (M) connector to interface (F) connector on digital controller. See Fig.9.

3.9 Before putting the controller unit into operation for the first time, connect the AC adaptor to the corresponding socket on the rear side of the controller unit.

3.10 Before switching ON the instrument please read the instructions given in the SECTION 10 “GETTING STARTED”. **IT’S IMPORTANT TO CONDUCT HOMING CYCLE AND BASE PLATE REFERENCE CYCLE EVERY TIME YOU SWITCH ON THE INSTRUMENT.**

3.11 Now the Instrument is ready to use.

Installing Magnascan for squareness measurement

- Place the Magnascan (Digital Dial) on the Magnascan carrier as shown in the Fig.4:

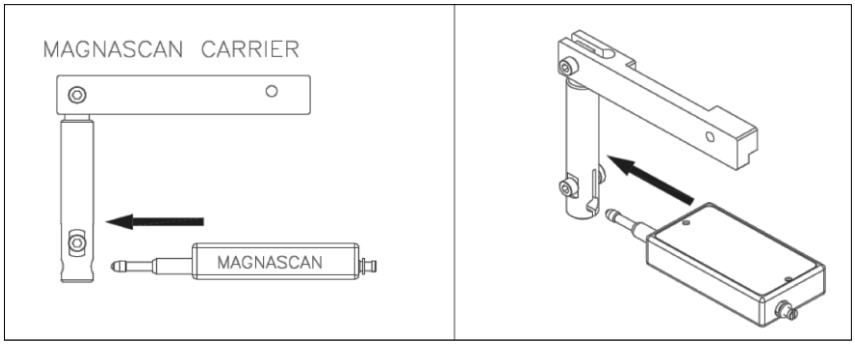


Fig. 4

Tighten the M4 Allen screw on the carrier with the help of a 3mm Allen key.

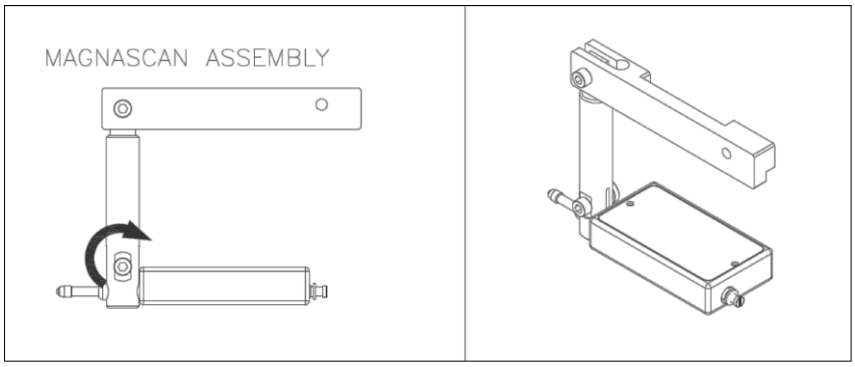


Fig. 5

- Remove 2 M4 CSK screws and small weights mounted on machine yoke with the help of a 2.5mm Allen key and store safely for future reassembly.

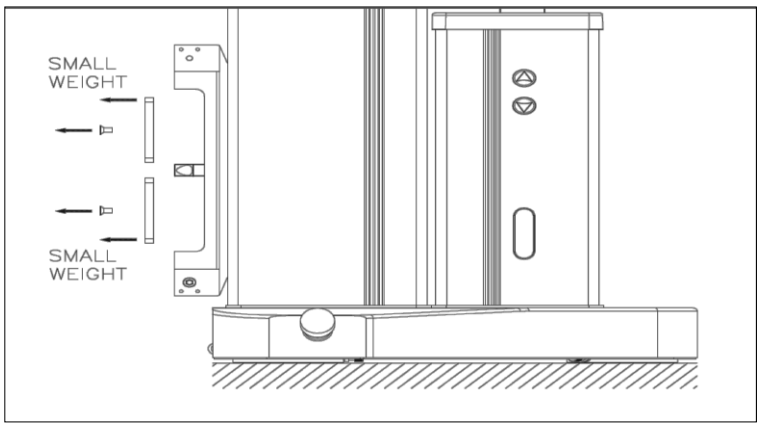


Fig. 6

- Place the Magnascan carrier assembly into the probe holder as shown in the diagram below. Tighten the M5 screw to clamp the assembly.

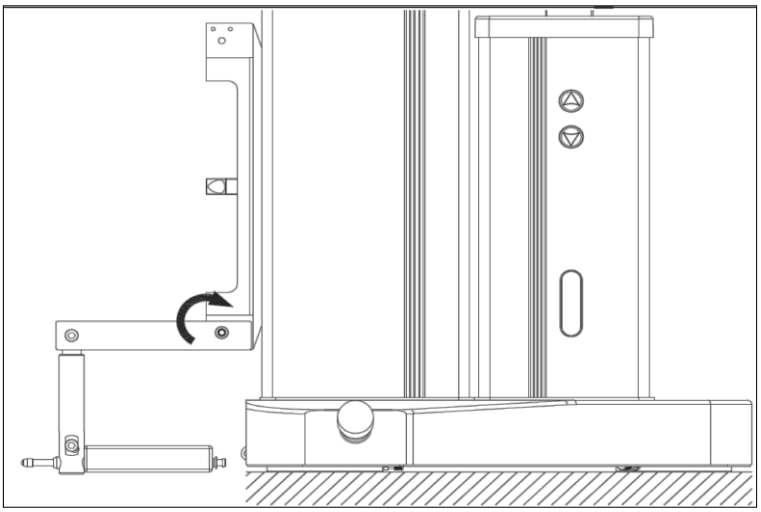


Fig. 7

4. Measuring Accuracy

To achieve good accuracies and precision following instructions will be helpful:

- Use only Grade ‘0’ surface plate. Keep surface plate clean. Use soft and clean fabric, soaked with alcohol to clean the surface plate.
- Surface plate should be properly damped for vibration free operations of the instrument.
- Clean air cushioning pads provided at the bottom of the instrument periodically. See section 3.1.
- Clean the work piece before starting any measurement task.
- Confirm that all the joints of square probe holder assembly are tightened properly. Position square probe holder assembly properly in the yoke by locating it in the V groove provided on the yoke and tighten M5 screw.
- Though manual movement of yoke is allowed, try to use jog keys for motorized movement of the yoke in between two measuring points. This will help to maintain smooth operation avoiding jerks and ultimately reduces manual errors.
- Reference Zero to the surface plate is essential before starting any measurement task.
- Probe diameter calibration as instructed must be carried out to get accurate results.
- Whenever two bodies contact with each other, they bounce for a short time. This happens when the probe touches the work piece. During this short time of period measuring value oscillates accordingly. Thus the instrument has to wait until the measuring value becomes stable before acquiring the final value. Acceptance of any measuring value is indicated by beep sound.
- In case of concave or convex surface for e.g. bore or shaft diameters, maximum and minimum points are to be determined. To determine this; position the probe eccentrically inside the bore or below the shaft. Press the appropriate function key. Probe will start moving by exerting measuring force on the work piece. Operator must move the work piece or the instrument whichever is possible to pass over the maximum and minimum point. After completion of measurement at top and bottom of the bore or shaft controller unit will give beep sound. The quality of measuring results reflects in the handling of the measurement procedure by the operator.

Instructions for the operator to improve the quality of the measuring Results:

- The quality of the surface plate directly influences the measuring result. Thus keep the surface plate free from dust, chips, oil and dirt.
- Try to move the work piece or instrument with constant force.
- Do not touch any moving part of the instrument or the job at the time of measuring cycle.
- Temperature of the work piece and the instrument should be same at the time of measurement. (At least 4 hrs. of soaking time is required to maintain the same temperature of the work piece and the instrument in the same environment.)
- Usually, the air cushioning pads are only used for positioning the height measuring instrument before a measurement. If the air bearings are required during the measurement (large/heavy work piece), the reference point should also be measured with the air cushioning switched on.

5. Specifications:

Specifications for Precihite Ultra

Description	**Precihite Ultra 450**	**Precihite Ultra 600**	**Precihite Ultra 1000**
Measuring Range	450 mm	600 mm	1000 mm
Expandable Range	765 mm	915 mm	1315 mm
Resolutions	0.01, 0.001, 0.0005, 0.0001 mm		
Repeatability*[1] (2S)	0.001 mm		
Maximum Counting Speed	600 mm / sec		
Maximum Permissible error *[1] (L = Length in mm)	(2 + L / 400) µm		
Squareness *[2]	5 µm	6 µm	10 µm
Battery Backup Time	8 hours		
Operation Temperature	10 °C to 40 °C		
Rapid JOG speed	35 mm / sec		
Weight of Machine	19 Kg	21 Kg	28 Kg

Specifications for Precihite Magna

Description	Precihite Magna 450	Precihite Magna 600	Precihite Magna 1000
Measuring Range	450 mm	600 mm	1000 mm
Expandable Range	765 mm	915 mm	1315 mm
Resolutions	0.01, 0.001, 0.0005, 0.0001 mm		
Repeatability*[1] (2S)	0.002 mm		
Maximum Counting Speed	600 mm / sec		
Maximum Permissible error *[1] (L = Length in mm)	(3 + L / 300) µm		
Squareness *[2]	5 µm	6 µm	10 µm
Battery Backup Time	8 hours		
Operation Temperature	10 °C to 40 °C		
Rapid JOG speed	35 mm / sec		
Weight of Machine	19 Kg	21 Kg	28 Kg

AC Adaptor Specifications:

1. Input : 100 VAC to 240 VAC, 50/60 Hz
2. Output : 24VDC, 2.5A

ACCURACY DEFINITION:

- Repeatability error: This is the error in the ability of the instrument to give consistent readings for one measurement point when the travel of the probe is same. The repeatability is checked for eleven times to ensure the specified consistency. This error is specified on diameter 6mm X 48mm probe and can show non-specified variations on other probes (specially the weak neck probes and the long length probes).
- Uncertainty of the product: This is the error of the instrument which can get super imposed or added on the calibrated accuracy of the machine over the total specified travel. This error is specified on diameter 6mm X 48 mm probe at 20 °C.
- Position accuracy: This is the difference between a master length gauge value and the displayed value. This error is specified on the diameter 6mm X 48 mm probe at 20 °C.
- Squareness Error: This is an error displayed by the instrument if the instrument is checked in squareness mode with a Magnascan against a master square gauge. This error is specified for the instrument only with accessory MAGNASCAN at 20 °C.

✓ **Note:**
  - **Values are valid with a standard probe at temperature of 20°C.**
  - **Measured with the electronic probe "Magnascan".**

6. Description:

Machine:

1	Machine column
2	Controller unit - EL100
3	Upper probe holder
4	Handle for manual movement of carriage
5	Mechanical probe
6	UP / DOWN Jogging keys
7	Test Piece
8	Air cushioning switch
9	Machine handle
10	Machine base

Fig. 8

Controller Unit – EL100:

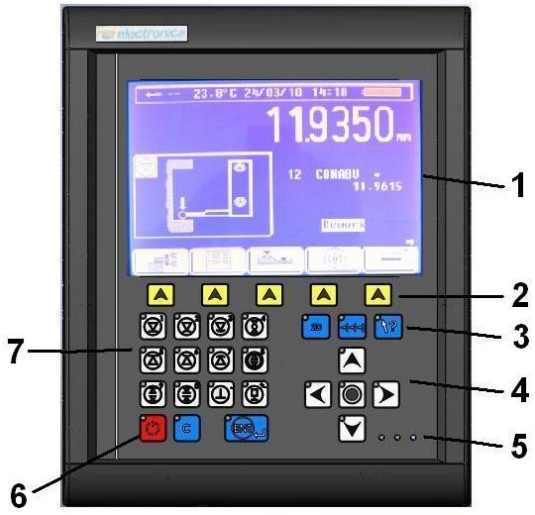


Fig. 9

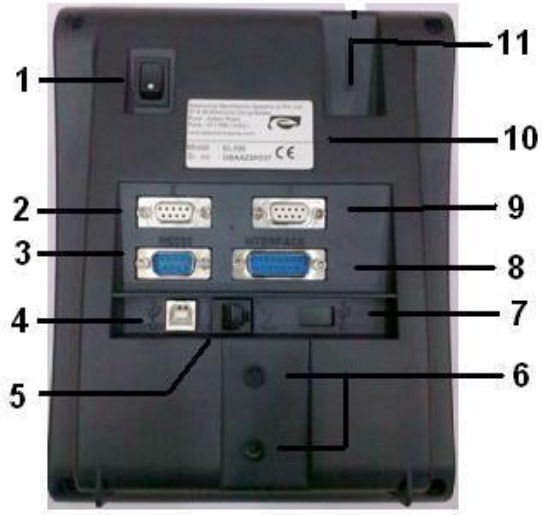


Fig. 10

1	LCD Display
2	Soft Keys
3	Utility Keys
4	Arrow Keys for Navigation
5	Rework / OK / Reject LED indications
6	LCD Standby On / Off Key
7	Numeric / Function Keys

1	On/Off Switch
2	Z Axis input for scale
3	RS232 serial interface
4	USB cable Interface
5	Option for future model
6	Mounting holes
7	Option for future model
8	Interface connector
9	X Axis input for Magna scan
10	Company sticker
11	Adapter input

Description of Keys:

Key	Description
	Contacting a plane from above / Numeric Key 1
	Contacting a shaft from above / Numeric Key 2
	Contacting a bore from above / Numeric key 3
	Measuring Shaft diameter and center / Numeric key 4
	Contacting a plane from below / Numeric key 5
	Contacting a shaft from below / Numeric key 6
	Contacting a bore from below / Numeric key 7
	Measuring Bore diameter and center / Numeric key 8
	Measuring Groove width and center / Numeric key 9
	Measuring Ledge width and center / Numeric key 0
	Measuring job squareness / decimal entry
	Set Multiple references / ± entry
	LCD Standby key
	Cancel key
	Enter key
	UP Arrow key
	DOWN Arrow key
	LEFT Arrow key
	RIGHT Arrow key
	Select key
	2D function key
	Program Key

	HELP key
	Soft keys (5 Nos.)

Note: A new technology soft touch keyboard is used in the controller. This keyboard requires only a soft touch with a finger for the keys to operate. An LED near the key indicates proper operation of the key along with a beep sound (if enabled in Setup).

Also it may please be noted that if every time the same key has to be operated the finger must be removed and touched on the key again.

7. Layout of the Screen:

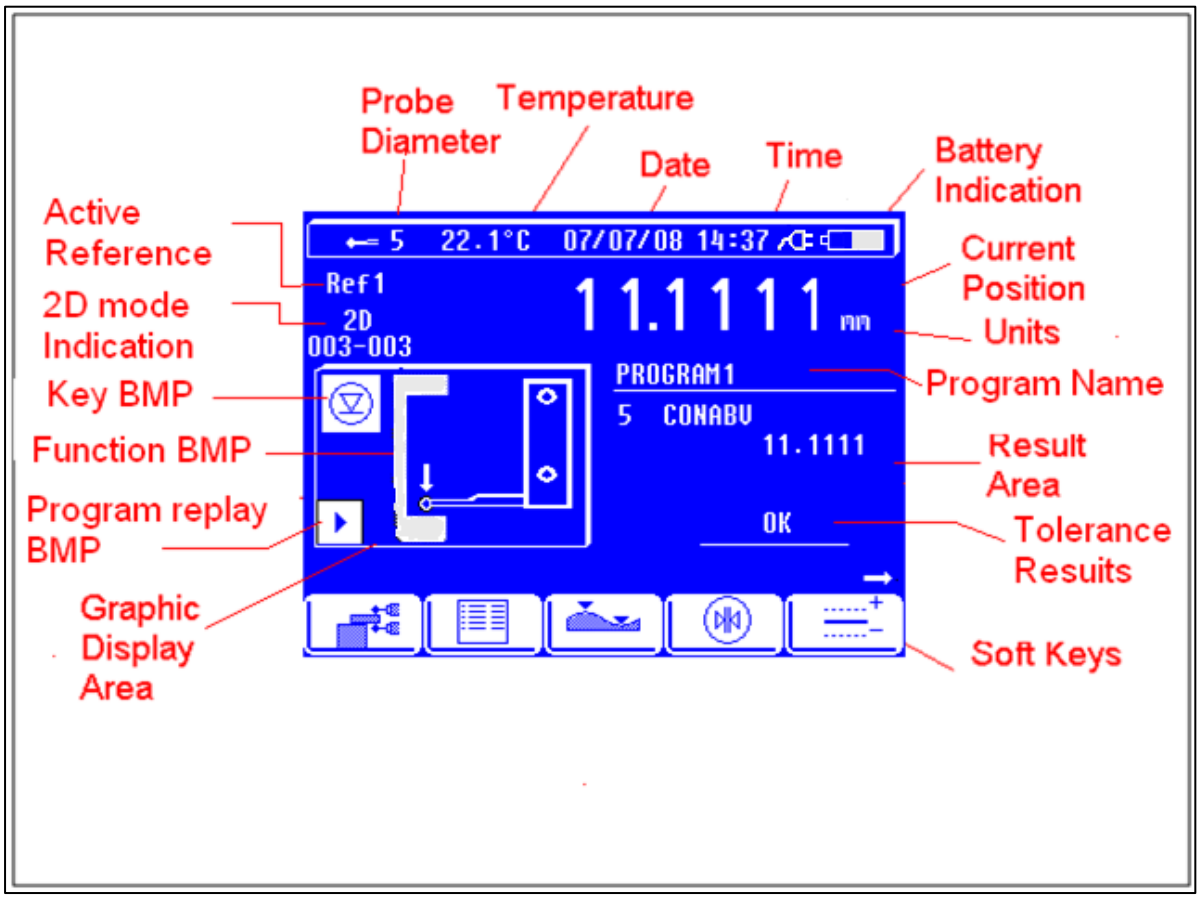


Fig. 11

- ✓ **Note: In this manual, following notations will be used**
  - **[name] denotes a dedicated key name**
  - **{name} denotes a Soft key name**

8. Battery Indications:

A battery symbol is displayed in the right top corner of the screen. This symbol indicates the status of the battery. The full battery symbol will blink indicating that the battery is getting charged. A steady battery symbol will show the current capacity of the battery. The following table will illustrate in more details.

State	Symbol	Description
1		Battery is getting charged (Fast charging process)
2		Battery with full Charged and load is on Adapter
3		Battery with half capacity
4		Battery low
5	(Blinking)	Battery very low. Charge immediately. If the user continues to work with this state, the controller will shut down automatically in 10 minutes. The user must switch OFF the controller with power switch and charge the battery immediately. If this is not done, battery might get damaged and may need to be replaced.
6		Battery is Trickle charging.

The battery is trickle charged when it is used beyond its capacity or it is deeply discharged due to some reason. The controller senses this condition and first trickle charges this battery up to certain level and then it starts fast charging. The trickle time may vary depending on the level of discharging. When the adaptor is first plugged to start the battery charging the controller first starts with trickle charging for few minutes till it analysis the battery conditions and then starts fast charging. A deep discharged (depleted) battery may take maximum of 8 hours for trickle charging and then starts fast charging. Fast charging may take

maximum of 4 hours. This time may vary with different batteries and ambient temperature and the level of discharging.

Whenever charging a deep discharged battery, the controller might stop fast charging in between. This happens due to the use of battery beyond its capacity. In this case the controller prompts the user with the following message. Just turn off the EL100 controller and the battery adaptor, wait a few seconds and then turn them on again. If this message is seen very frequently, then this might need the battery replacement. In this case report this to the manufacturer or dealer.

Note: The user should not continue to use the controller if it is in state 5. If he continues, the controller will shut down automatically. The user must switch OFF the controller with power switch at the back and charge the battery immediately. If this is not done, battery might get damaged and may need to be replaced.

9. EL100 Controller Settings:

The EL100 setup can be accessed by pressing [ ] key followed by the { } key. The following options will be available:

9.1. "Sleep mode Time (MIN)" – This sets the stand by time for the display. The power LED blinks indicating the controller in standby mode. The standby time should be set between 5 to 120 minutes.

9.2. "Key Beep Enable" – This option will enable / disable the beep on key press.

9.3. "Diagnostics" – This has two further options:

9.3.1. Keyboard – using this option, the user can check the functioning of all keys. Press [ ] twice to exit from this mode. Pressing [ ] will display the help on this mode.

9.3.2. Encoder – using this option, the user can check whether the scale is working properly.

9.4. "Disp. Resolution um" – Using this option the user can select the display resolution of Z axis.

9.5. "Measurement Unit" - This selects the measurement units, Metric (mm) or Imperial (inch).

9.6. "Probe Dia Constant" - This will display the current probe diameter calibration value.

9.7. "Date & Time Settings" – Using this option, the date and time settings of the controller can be made.

9.8. "Temperature" – This option decides whether to enable / disable the online temperature compensation and can enter the desired temperature coefficient.

9.9. “Set Printer” – Using this option printer can be set in manual or auto mode. Refer “Printer Settings and Operations” for more details.

9.10. Edit User Info” – User can set Customer name, Machine name and Operator name from this option. Refer to “Printer Settings and Operations” for more details.

9.11. “Serial Communication” – User can set parameters for serial communication. Refer to “Serial Port Settings” for more details.

9.12. “Battery Info.” – This option shows Time and date of last full recharge of battery, current status of battery charged(%), approximate backup time and current power source.

9.13. "Factory Settings" – This is a password protected option used during calibration of the machine. This is not accessible to the user.

10. Getting Started:

Step 1: Selecting Language

On power on, EL100 operating language can be selected by pressing the {Language} at the lower left corner of the Splash screen.

Step 2: Base plate referencing

The controller automatically executes base plate referencing after every power “ON” on selecting any key other than {Language} soft key.

Base plate referencing can also be performed by pressing the [ ] key twice.

Step 3: Probe diameter Calibration

It is recommended to calibrate the probe diameter every time a probe is changed. { } will enable calibration of Probe diameter. Before going into the function ensure that the probe is below the slip of calibration setting master supplied with the machine. When pressed, the controller will perform surface probing on the slip bottom surface and automatically reposition the probe above the top surface. The operator should clear the probe travel path while auto positioning by moving the slip a little & then again ensure that the probe is above the slip top surface. The controller will automatically perform surface probing on the slip top surface and show you the result. The current diameter is displayed on the screen. The operator can start the probe calibration again by pressing the { }. The controller can average all the values of probe calibrated and show an average result.

Press [ ] to save the calibrated result and exit from the function.

Press [ ] when finished. Press [ ] to exit without saving the result.

11. View Result Buffer

User can view Result Buffer by using { } key. Latest results get stored in result buffer. The results can be scroll using [ ] and [ ] key.

11.1. **Edit Result Buffer:** The values in the result buffer can be edited using this { } key. Follow the steps for editing:

11.1.1. Select the required result for editing by using the [ ] and [ ] key.

11.1.2. Press { } key. The “Edit selected” Message will be displayed.

11.1.3. Enter the required value using the Numeric keys and press [ ] key.

- ✓ **Note: This should be used only during the storage of the programs as those results are considered as nominal values for replaying programs.**

11.2. **Delete Result Buffer:** The results in the result buffer, can be deleted by pressing { } key. When { } key is pressed, the operator is prompted with two options:

11.2.1. { }: Selected result get deleted. User can select specific result using arrow key. If function has multiple results, user can delete all related results by deleting first result of those. User cannot delete 2D results after 2D function is finished. User cannot delete programmed results after programming is completed.

11.2.2. { }: This will delete all the results from the result buffer, which cannot be restored again. The operator needs to confirm this option by selecting { } or { }.

11.3. **Print Result Buffer:** For printing result buffer user can press { } key. User can print All or Selected data from result buffer. Refer to “Printer Settings and Operations” for more details.

12. Basic Measurements:

If related tolerances are activated, the tolerance result will be displayed on display with their “OK”, ”Rework” or ”Reject” categories (Ref. section 13.6).

The basic measurements are broadly categorized in two categories:

12.1. **Surface measurement:**

12.1.1. Contact above measurement: This function can be performed by pressing [ ] key. In this function, a plane is contacted from above to determine the height of the plane from earlier selected reference point. The result is displayed on the display and gets stored in result buffer as “CONABV” and the value. This is illustrated in the Fig.12.

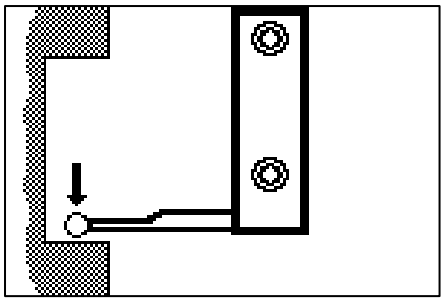


Fig. 12

12.1.2. Contact below measurement: This function can be performed by pressing [ ] key. In this function, a plane is contacted from below to determine the height of the plane from earlier selected reference point. The result is displayed on the display and gets stored in result buffer as “CONBLW” and the value. This is illustrated in the Fig.13.

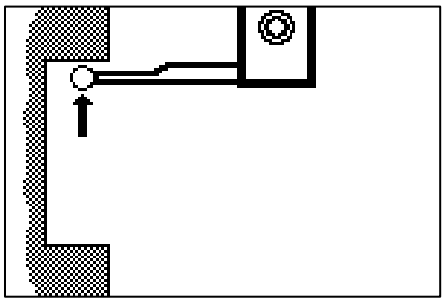


Fig. 13

12.1.3. Shaft above measurement: This function can be performed by pressing [ ] key. In this function, a shaft is scanned from above to get the highest point. For scanning the shaft, the operator can either move the job or the machine. The result is displayed on the display and gets stored in result buffer as “SHFABV” and the value. This is illustrated in the Fig.14.

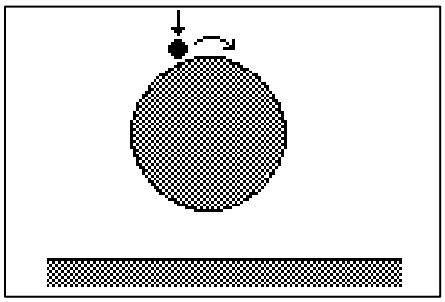


Fig. 14

12.1.4. Shaft below measurement: This function can be performed by pressing [ ] key. In this function, a shaft is scanned from below to get the lowest point. For scanning the shaft, the operator can either move the job or the machine. The result is displayed on the display and gets stored in result buffer as “SHFBLW” and the value. This is illustrated in the Fig.15.

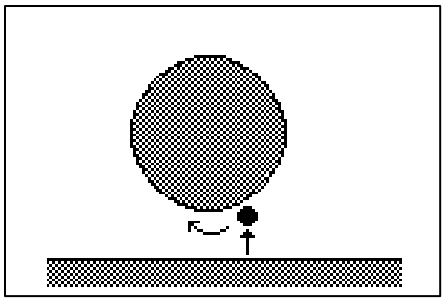


Fig. 15

12.1.5. Bore below measurement: This function can be performed by pressing [ ] key. In this function, a bore (hole) is scanned from above to get the lowest point. For scanning the bore, the operator can either move the job or the machine. The result is displayed on the display and gets

stored in result buffer as “BORBLW” and the value. This is illustrated in the Fig.16.

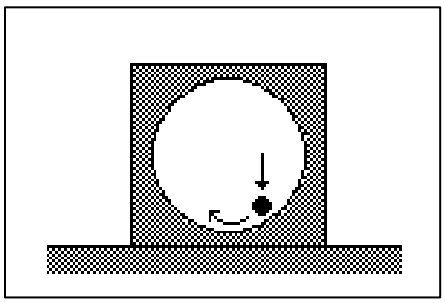


Fig. 16

12.1.6. Bore above measurement: This function can be performed by pressing [ ] key. In this function, a bore (hole) is scanned from below to get the highest point. For scanning the shaft, the operator can either move the job or the machine. The result is displayed on the display and gets stored in result buffer as “BORABV” and the value. This is illustrated in the Fig.17.

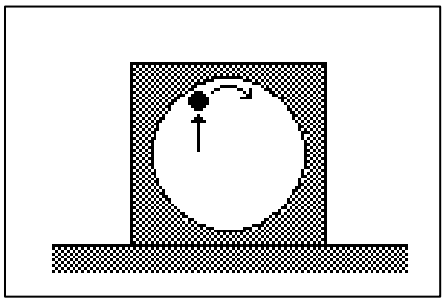


Fig. 17

12.2. **Diameter and center measurement:**

12.2.1. Shaft diameter and center measurement: This function can be executed using [ ] key. In this function, a shaft is scanned from below and above in one setup to get its diameter and center from the earlier selected reference point. To avoid interference with the job, the operator needs to adjust the probe manually after the first surface scanning and then press [ ] key to proceed with the second surface scanning. The result is displayed on the display and gets stored in result buffer as “SHFCEN” and “SHFDIA” and the respective results. This is illustrated in the Fig.18.

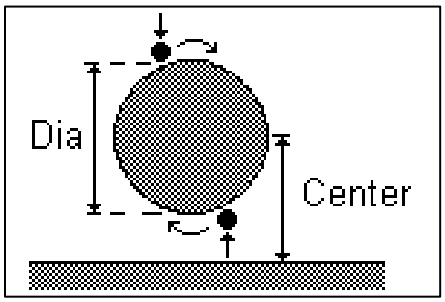


Fig. 18

12.2.2. Bore diameter and center measurement: This function can be executed using [8] key. In this function, a bore is scanned from above and below. After scanning from above {Pause} key will appear to pause this function in between. The measurement can be resumed by {Proceed} key.

The result is displayed on the display and gets stored in result buffer as “BORCEN” and “BORDIA” and the respective results. This is illustrated in the Fig.19.

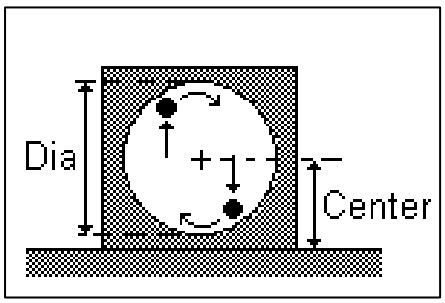


Fig. 19

- ✓ **Note: In case of user scanning the bore or shaft in wrong direction, the EL100 will display message “Change Direction”.**

12.2.3. Groove width and center measurement: This function can be executed using [9] key. In this function, an internal grove on shaft or bore is measured in an auto cycle by measuring its top and bottom edges. The result shows groove width, center and the height of both the groove edges. The result is displayed on the display and gets stored in result

buffer as “GRVWID”, “GRVCEN”, “GRVTOP” and “GRVBOT” and the respective results. This is illustrated in the Fig.20.

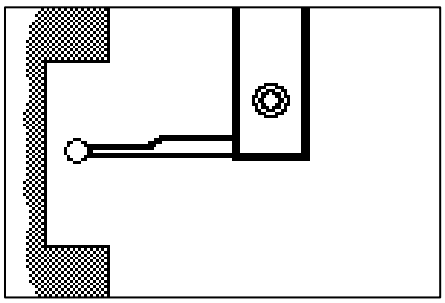


Fig. 20

12.2.4. Ledge width and center measurement: This function can be executed using [ ] key. In this function, an external protrusion or ledge is measured in an auto cycle. Similar to that in groove, the ledge top and bottom edges are measured and the width and center are calculated. To avoid interference with the job, the operator needs to adjust the probe manually after the first surface scanning and then press [

] key to proceed with the second surface scanning. The result shows ledge width, center and the height of both the ledge edges. The result is displayed on the display and gets stored in result buffer as “LDGWID”, “LDGCEN”, “LDGTOP” and “LDGBOT” and the respective results. This is illustrated in the Fig.21.

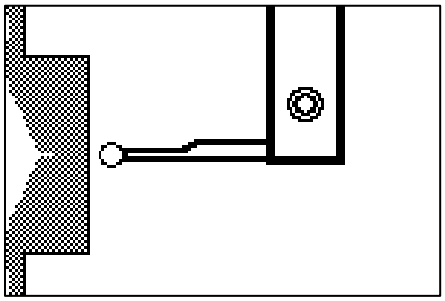


Fig. 21

13. Secondary Measurements:

Other than the basic measurements, there are some other functions which are illustrated below:

13.1. **Multiple references:** Multiple references can be stored and recalled. However it is suggested that the additional new references be kept as minimum as possible. Most of the jobs can be measured by maximum of two new references. This can be done by pressing the [ ] key. When the key is pressed, two soft keys will be displayed on the screen.

13.1.1. {

} – Operator can set new reference by following two methods.

13.1.1.1. Select a function by pressing the appropriate function key, which should be set as the current reference.

13.1.1.2. For selecting reference from memory user should press { } key. A particular result as new reference can be select using [ ] key. Next measurements will be according to new reference.

✓ **Note: Only following results can be selected as a new reference.**

CONABV, CONBLW, SHFABV, SHFBLW, BORABV, BORBLW, GRVCEN, GRVBOT, GRVTOP, LDGTOP, LDGBOT, LDGCEN, MAXIMA, MINIMA, BORCEN, SHFCEN.

Thus the result will be taken as a reference point. The result window shows “REF” tag followed by the reference number and its value. Also, the active reference number is displayed near the probe position display.

13.1.2. {

} – The previously saved references can be recalled using this key. The operator will be prompted for a reference number which can be entered using the numeric

keys. An “INVALID” message will be displayed if the entered reference is not present. After correct numeric entry, the result window will show “REF” tag followed by recalled reference number and its value. Also, the recalled reference number is displayed near the probe position display.

- ✓ **Note: The base plate reference can be performed by pressing the [ ] key two times. The result window will show “REF0” followed by 0.0000. Base plate reference is the Master reference for all measurements.**

13.2. **Angle Measurement:** This function can be performed by pressing { } key. This function allows the operator to measure the angle of a tapered surface with reference to the reference surface. Follow the following sequence for the measurement

13.2.1. Enter the slip value which is the distance between two points for the angle calculation.

13.2.2. Select Function for probing the first point. Respective picture will appear on the screen.

13.2.3. Now, Select Function for probing the second point.

13.2.4. The value of the angle is calculated and displayed in “Deg Min Sec” mode and is stored in the result buffer

13.3. **MIN, MAX, DELTA Measurement:** This function can be performed by pressing { } key. First the operator is prompted to select the direction of scanning. Then the machine detects a surface in the selected direction and then calculates following results

13.3.1. MIN: The minimum value of the scanned surface.

13.3.2. MAX: The maximum value of the scanned surface.

13.3.3. DELTA: The difference between MIN and MAX.

The operator can toggle the display to show MIN, MAX or DELTA by pressing [ENT] key.

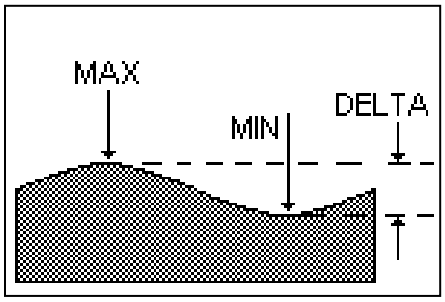


Fig. 22

The machine keeps on updating the MIN, MAX and DELTA values till {Finish} key is pressed. On “Finish” the results are displayed on the screen and are stored in the result buffer.

This function can be effectively used to align heavy jobs on fixtures.

13.4. **Distance Measurement:** Two soft keys are shown on display after pressing {} key to perform distance measurement.

13.4.1. {} key calculates the difference between the two previously stored results.

13.4.2. {} key calculates the center between the two previously stored results.

The results can be selected by browsing in the result buffer using [▲] and [▼] key.

13.5. **Squareness (Perpendicularity) Measurement:** This function can be performed by pressing [] key. Perpendicularity error of a work piece can be determined using a Digital Dial “Magnascan”. Refer to the installation procedure given in chapter 3 for installing the Magnascan. Perpendicularity error of a work piece can be measured on “Frontal” as well as “Lateral”

faces. When the [ ] key is pressed, the operator needs to enter the measuring range “Z Rng”. This is basically the height for which the perpendicularity / squareness is to be measured. Before pressing enter, ensure that the Magnascan is connected to the machine using its carrier and it is positioned on the surface. Make sure that the Magnascan is pressed on the job by approximately 0.5mm by moving either the job or the machine. The movement of the Magnascan is shown on the display in front of “X Cur”. After entering the range, the controller will first make the Magnascan reading “Zero”. The display shows Main axis and Magnascan as Auxiliary axis. The graphic shows true probe position. After completing the entered distance the controller shows the results as shown in the Fig.23.

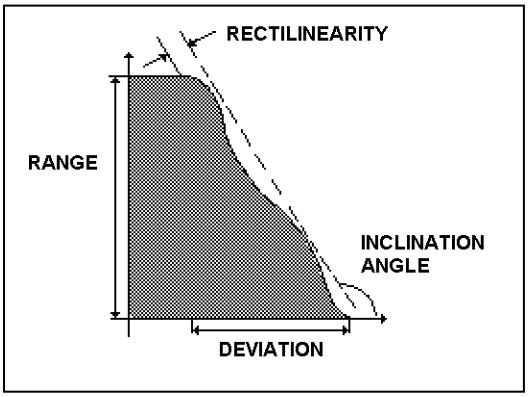


Fig. 23

A {Pause} key is provided to pause this function in between the measurement. This can be used whenever there is an obstacle on the surface like bore. The measurement can be resumed by {Proceed} key.

This function can be executed in two ways:

13.5.1. Motorized mode: In this mode, the controller will automatically execute the function using the motorized movement as explained in above points.

13.5.2. Manual mode: In this mode, the operator can take the machine carriage manually faster than the motorized speed. The controller will start the function motorized by default. It is up to the operator whether to move the carriage manually.

Press [

] key to exit the measurement.

Caution: - The Precihite cannot measure squareness by a dial indicator.

13.6. **Tolerance Mode:** The Tolerance mode allows the operator to set different measurement limits and compare the measurements with these limits. The results for this comparison are divided into three categories REJECT, REWORK and OK which are indicated by different LED colours, green for OK, red for REJECT and orange for REWORK. In this controller, there are three types of Tolerances which the operator can set:

13.6.1. Surface

13.6.2. Diameter

13.6.3. Center coordinates

For each of the types, the tolerance can be activated / deactivated by {

} / {

} key. The operator can set a nominal value and its range for each tolerance type. These values are saved on power cycle.

Press [

] key to save the changes and exit the tolerance mode.

Press [

] key to exit the mode without saving any changes.

13.7. **Offset Function:** The Offset function is actually a reference with an offset. In this function a different height can be assigned to a measurement instead of its true result. Thus the whole measurement range shifts by the entered offset. This function is normally used when the probe is clamped on the upper holder instead of the lower. Due to this the measurement range gets shifted, thus expanding the measurement. Following procedure explains the method for executing this function:

13.7.1. Clamp the probe to the upper probe holder.

13.7.2. Place a standard slip with a known slip value under the probe.

13.7.3. Press {

} key. The operator is prompted for the offset value. The {

} key will now display {

}.

13.7.4. Enter the slip value here and press [

].It is advisable that the slip value is measured on the Precihite prior to entering the offset mode. Enter this measured value in lieu of the actual slip size to eliminate the thermal size variation of the slip. Hence the readings measured in offset mode are more accurate.

13.7.5. The operator is prompted for selecting a measurement for probing the slip.

13.7.6. The controller performs the function and applies the entered offset to the result. The result buffer will show “OF ON” with the offset value. Now, all the subsequent measurements will be referenced with this offseted value.

✓ **Note:**

- To clear the applied offset, press again {

} key. The result buffer will show “OF OFF”.
- Optional probes specified as “Non-standard lengths” have to be used in OFF-SET mode.

13.8. **Contrast adjustment keys:** Display contrast can be adjusted using {
} (increase brightness) and {
} (decrease brightness) keys.

Advanced Measurements:

13.9. **TWO Dimensional measurements (2D):** Two dimensional measurements (2D) are possible in Precihite. Just by rotating the job by 90°, one can perform the measurements in other direction also. A [2D] key provided for this functionality.

✓ **Note: Starting the 2D measurements will clear the entire result buffer buffer.**

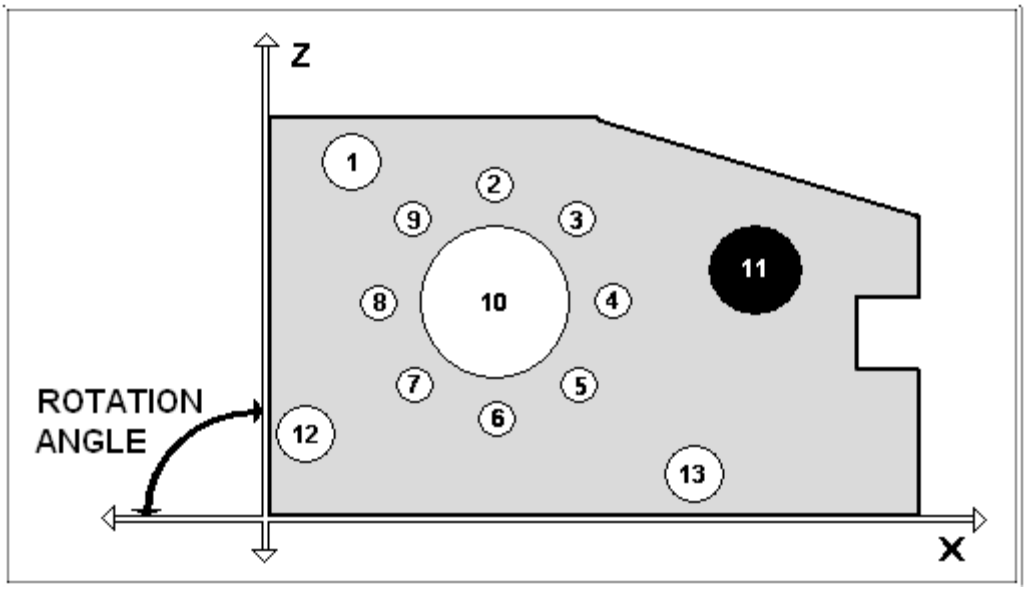


Fig. 24

Steps for the 2D measurement:

13.9.1. Number all the Bore, Shaft, Groove and Ledge on the test piece as shown in the above diagram. Measurement should execute in the sequence to get the required 2D results. User might get wrong results if the sequence not followed.

13.9.2. Press [2D] key followed by {Start} key. The Display will flash “2D” and “STRT2D” is added in the result buffer.

13.9.3. Perform all the measurements in Z direction as per the sequence. Note that only [8],[4],[0] and [9] keys will be active in 2D measurements. The number of steps performed will also be displayed on the Screen.

13.9.4. After performing all the measurements in Z direction, press [C] and then press [2D] key followed by {Rotate} key. Here, the operator needs to enter the Rotation angle in DEG.MIN.SEC units. Also a soft key is available to select the rotation direction. Toggle the direction by pressing the soft key and select the required rotation direction. The { } indicates that the current rotation is set to counter-clock wise, See Fig. 26. and { } indicates the current rotation is set to clock wise, See Fig. 25. The default angle will be 90°. “JOBROT” tag will be added in the result buffer, followed by the “ANG” and entered rotation angle.

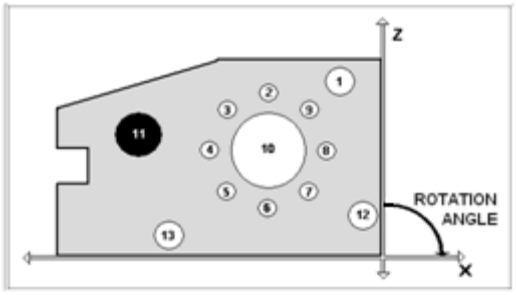


Fig. 25

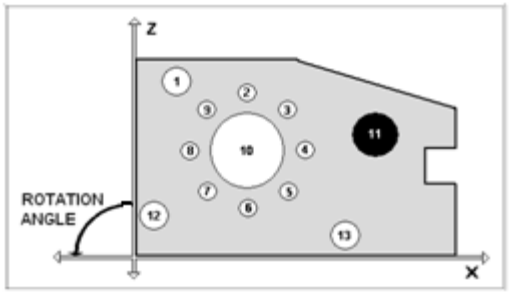


Fig. 26

13.9.5. Rotate the test piece and start performing the measurements in X direction in the same sequence used for Z direction.

13.9.6. After completing all the measurements in X direction, press [2D] followed by {Finish} key. “FIN2D” will be added in the result buffer. Here the basic measurements are completed.

13.9.7. Now, different functions can be performed using the [2D] followed by {2D Fn} key on the 2D table formed by the above measurements. The Original and calculated tables can be viewed any time when in 2D measurements using { } and { } respectively. The available 2D functions will be illustrated in next section.

13.9.8. Press { } to exit from the 2D mode. Selecting { } option after pressing { }, the operator can save all the 2D measurement performed. A 16 character name can be given to the stored buffer using the Data entry mode. Selecting { } will exit the 2D mode without saving the buffer.

✓ **Note: The saved buffers can be viewed by selecting [ ] mode followed by { } option available only before starting the 2D mode.**

2D Functions: Following functions will be available after completing all the measurements in both the directions:

13.9.9. Datum Function: There are two options in Datum functions.

13.9.9.1. { }: Any pre-measured bore / shaft center can be selected as a datum from the original table. On selecting this option, the Original table will be displayed. Use [ ] / [ ] key to navigate in the table, and use [ ] key to select. The selected bore / shaft will be highlighted. After selection, press { } to apply the selected as datum. “DATUM” tag gets added in the result buffer followed by the selected POINT. After applying the datum function on the original table, a new table is created which can be viewed by { }.

13.9.9.2. { }: Using this mode, a datum can be set at a specific coordinate desired by the user. This datum also applies on the original table and calculated table is regenerated. After selecting this option, the operator

needs to enter X and Y coordinates and then press [ENT] to apply the coordinates as a datum. Press [C] to exit without applying the datum.

CAUTION: - IT IS NECESSARY TO DO THE DATUM FUNCTION AS PER 13.1.9 BEFORE THE 13.1.10 ALIGNMENT FUNCTION.

13.9.10. Alignment / Rotation function: Following options are available for Test piece alignment. It should be noted that the rotation of the job has to be done in counter clock-wise direction. Before applying the alignment functions select the direction of alignment whether clockwise (CW) or counter-clockwise (CCW) and then apply the required function.

13.9.10.1. {AlignX}: Rotation of X axis with one or two selected centers.

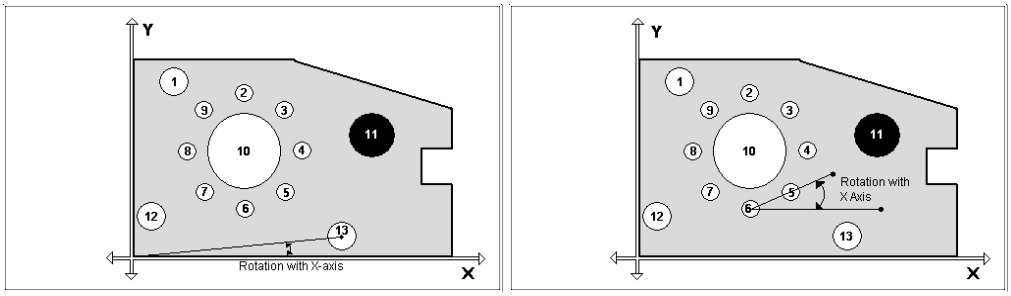


Fig. 26

13.9.10.2. {AlignY}: Rotation of Y axis with one or two selected centers.

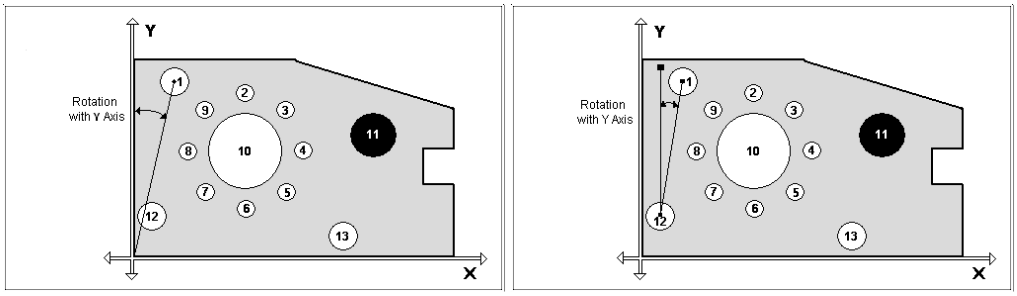


Fig. 27

✓ **Note:**- Additional Functions in AlignX and AlignY options for measuring relative distance between two selected Centers.

When user will select 2 centers the controller will show following options:-

a. In Straight Line:-
   Here two selected centers will be aligned to X or Y axis as per option AlignX or AlignY in selected direction of rotation.
b. Preset Coordinates:-
   Here user will be asked to enter X and Y coordinates (Preset Coordinates). On entering the two selected centers will first align in straight line making parallel to either X or Y axis as per option AlignX or AlignY selection.
   Then angle is calculated from entered coordinates and then the test piece is rotated with that angle as per direction selected.
c. Preset Angle:-
   This operation is same as option Preset Coordinates, only difference is, here the user needs to enter the angle instead of coordinates. Same angle is used for test piece rotation.

13.9.10.3. {AlignXA}: Rotation of X axis with entered Angle.

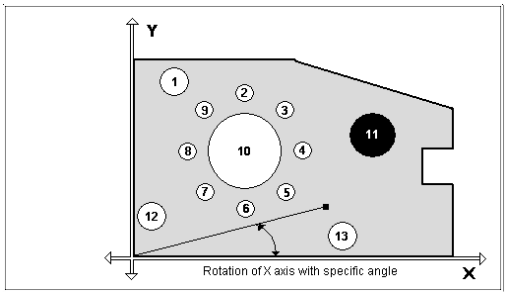


Fig. 28

13.9.10.4. {AlignYA}: Rotation of Y axis with entered Angle.

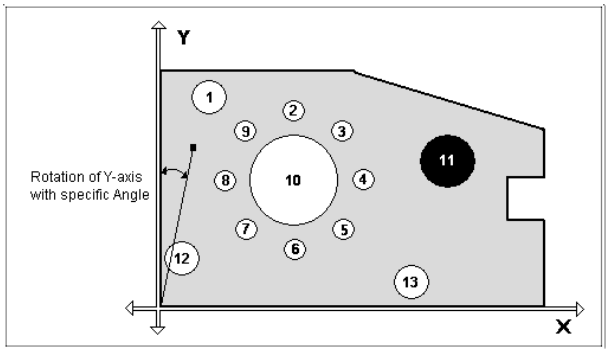


Fig. 29

13.9.10.5. {AlgXcor}: Rotation of X axis with angle formed by the datum and entered coordinates.

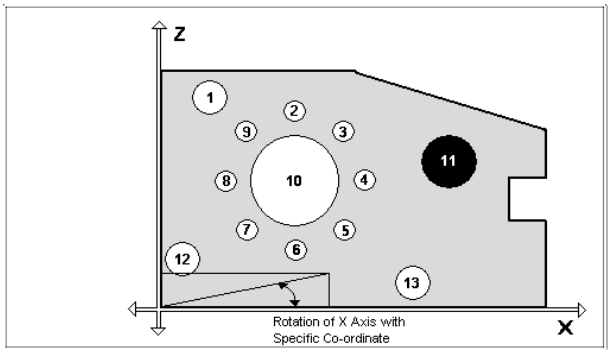


Fig. 30

13.9.10.6. {AlgYcor}: Rotation of Y axis with angle formed by the datum and entered coordinates.

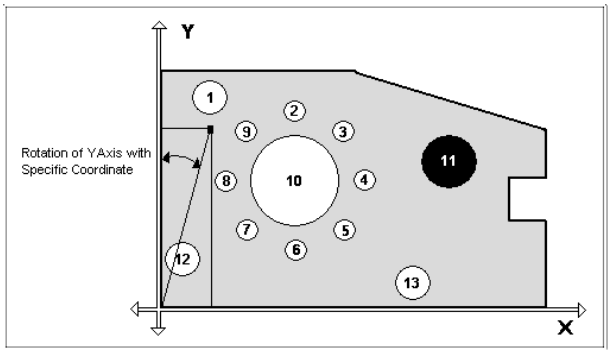


Fig. 31

- ✓ **Note: User can cancel the alignment done in 2D function by reselecting the datum.**

13.9.11. PCD function: This function will calculate a Pitch Circle Diameter (PCD) for the selected set of centers. On selecting this function, the calculated table is displayed on the screen. Using [▲] and [▼] key, the operator can navigate through the table and select desired points using the [●] key. The operator can select a maximum of 30 points for this function. And minimum three points are required for PCD. The following results get added in the result buffer after applying this function.

13.9.11.1. DIA – diameter of the PCD.

13.9.11.2. DMIN – the minimum diameter possible from the selected set of centers.

13.9.11.3. DMAX – the maximum diameter possible from the selected set of centers.

13.9.11.4. Center (X, Y) – the center coordinates of the PCD.

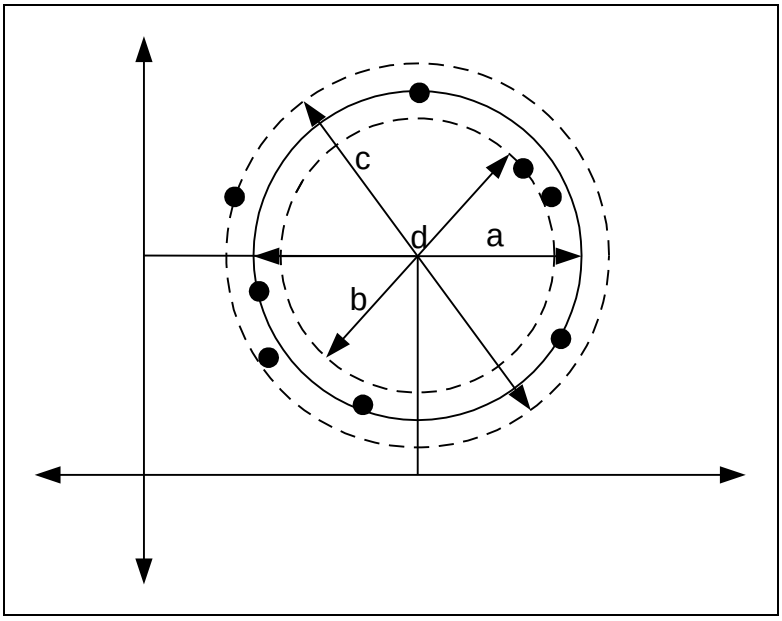


Fig. 32

13.9.12. Distance function: This function will calculate the distance between the two selected points and their projected distances on X and Y axis. The results get added in the result buffer.

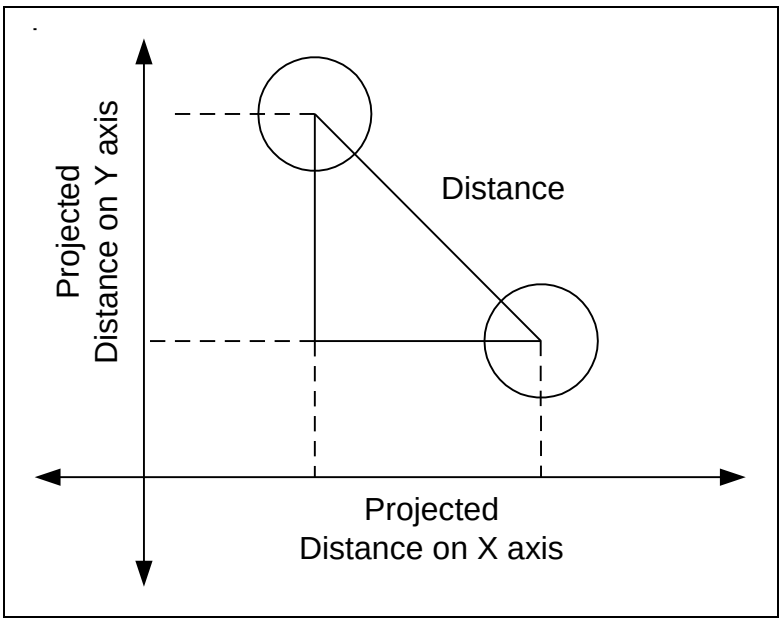


Fig. 33

13.9.13. Line Function: This function will construct a best fit line using a selected set of points. On selecting the function, the calculated table is displayed on the screen. Using [ ] and [ ] key, the operator can navigate through the table and select desired points using the [ ] key. The operator can select a maximum of 30 points for this function. Minimum two points are required for this line function. The following results get added in the result buffer after applying this function.

13.9.13.1. Angle: Angle of the line with respect to the X axis constructed form the set of points.

13.9.13.2. RECT: Rectilinearity of the line is the distance between the two farthest selected centers.

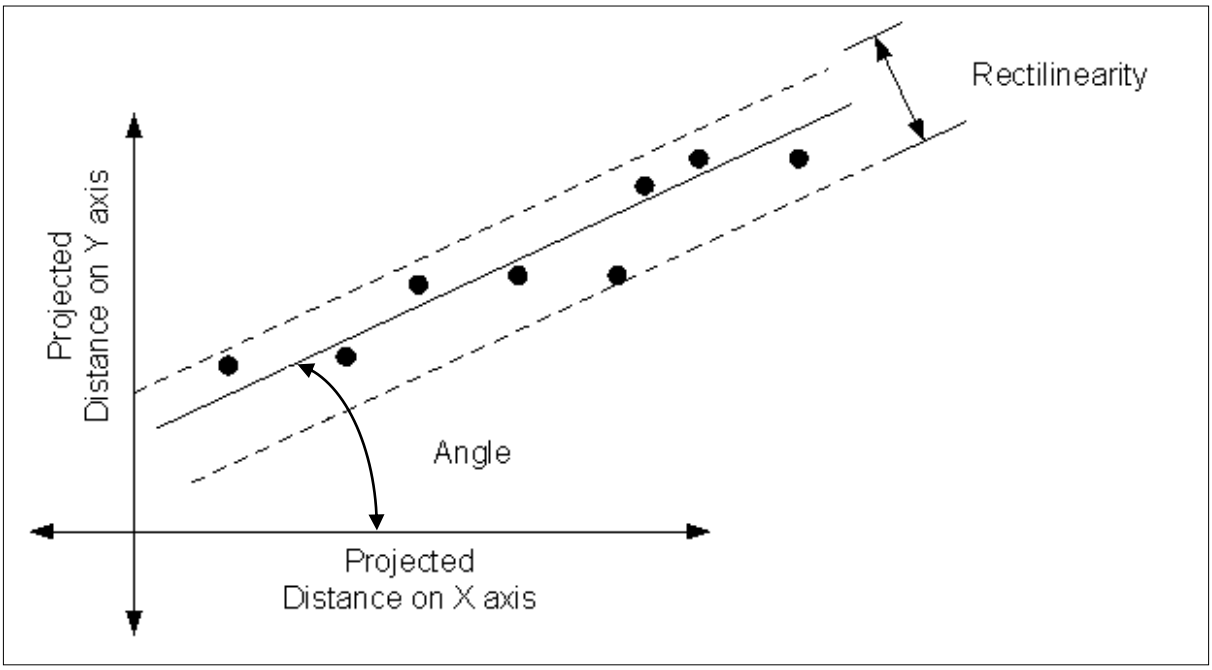


Fig. 34

13.9.14. Angle Function: This function calculates the angle for the selected set of centers. Maximum three centers can be selected for this function. Following results will be displayed depending on the number of centers selected.

13.9.14.1. If one point is selected, then the angle between the point, datum and X axis is displayed.

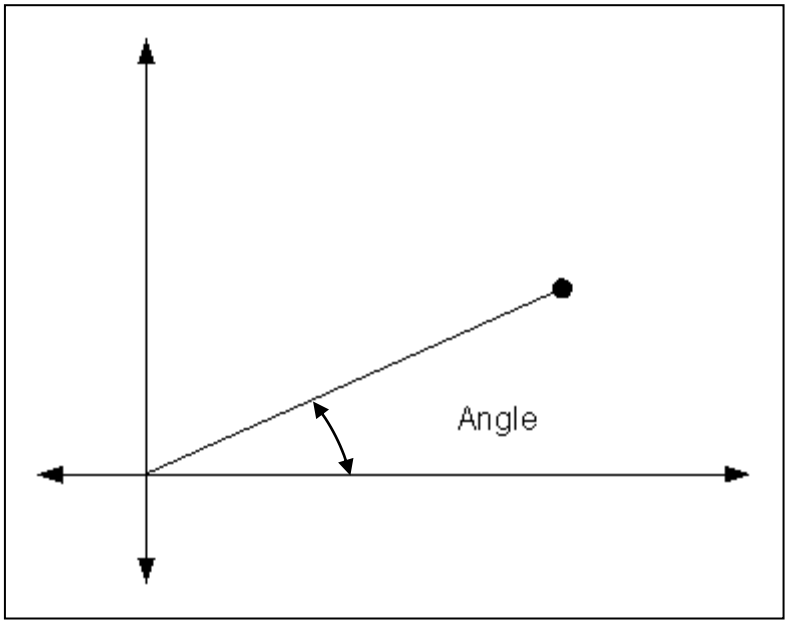


Fig. 35

13.9.14.2. If two points are selected, then the angle between the line formed by the two centers and X axis is displayed.

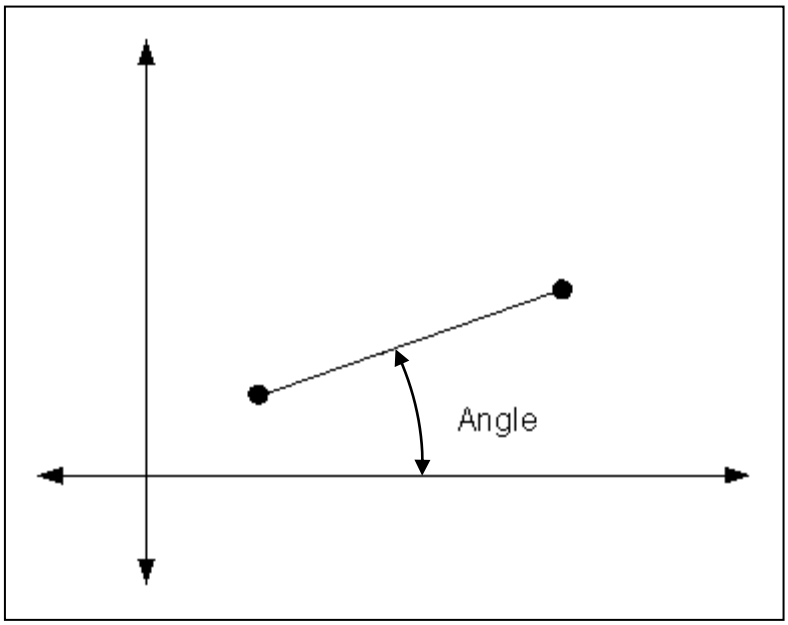


Fig. 36

13.9.14.3. If three points are selected, then the included angle between the selected points is displayed.

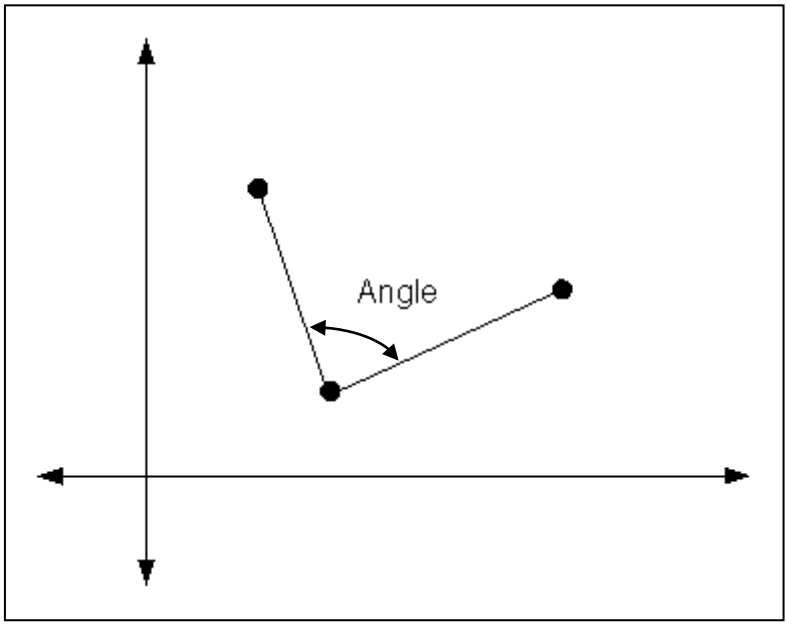


Fig. 37

- ✓ **Note: The user can store up to 10, 2D buffers in EL100. The DRO will give message as "Memory full" when the number is exceeding beyond 10.**

13.10. **Programming and Replay:** Programming feature can be used to automate the measurements for batch quantities. This feature can be accessed using [ ] key. When this key is

pressed, a list of previously stored programs is displayed on the screen. This list can be scrolled using the [ ] and [ ] keys. Following soft key options are available for the user.

{ }: This creates a new program.

{ }: This will execute the selected program.

{ }: The program name can be changed using this key. A "QWERTY" virtual keyboard will help to select job specific names. Maximum 16 characters name is allowed.

{ }: This will delete the selected program and all the other data associated with that program.

{ }: This will list all the results associated with that program.

{ }: This will list the different steps involved in that program. Using this mode, the operator can perform different statistics on the program steps.

[ ] will exit from program mode.

13.10.1. Create a New Program:

13.10.1.1. Press [ ].

13.10.1.2. Press { }. The controller asks for confirmation whether to proceed further. This is because; the entire result buffer gets cleared due to this action. If you want to proceed further press { }. "START PROG" will get stored in result buffer and the ◙ Bmp will appear on display, which indicates controller is in Program record mode.

13.10.1.3. Start recording all the different steps involved in a test piece by actual measuring a master piece. Note that the results during this execution are treated as Nominal

values during replay of this program. Tolerances can be enabled / disabled when in program mode. Also the upper tolerance and lower tolerance can be set during programming. During programming, the results can be edited / deleted using {

} and {

} keys.

13.10.1.4. Press [ ] again followed by [

] key to exit from the program mode. A default name “PROGRAM (X)” will be given to this program and will get added in the program list. This name can be changed later using the {

} key.

13.10.2. Execute a saved program:

13.10.2.1. Press [ ].

13.10.2.2. Select the desired program using the [ ] and [ ] keys and press {

}. The controller asks for confirmation whether to proceed further. This is because; the entire result buffer gets cleared due to this action. If you want to proceed further press {

}.

13.10.2.3. The operator is prompted to enter the no. of samples to test with the selected program.

13.10.2.4. Bmp will get appear on display as well as the name of Program will flashed on the screen indicating which program is being executed.

13.10.2.5. A step by step execution of the program starts prompting the user on every step to press [

] to proceed.

13.10.2.6. The controller waits till the probe auto positions as per nominal values stored during programming. After the auto position is achieved, the machine will execute the recorded step and show the result. Also, the status LEDs

will show as per the set tolerances. Note that the controller will give a loud beep as a warning if the probe over-travels.

13.10.2.7. After completing all the steps, the controller will prompt the operator to [

] to start the next job.

13.10.2.8. After completing all the jobs, the controller will show the results associated with that program along with the status due to the set tolerances.

13.10.3. View the result details of a program:

13.10.3.1. Press [ ].

13.10.3.2. Select the desired program using the [ ] and [ ] keys and press {

}. This will list all the results associated with that program.

13.10.3.3. Select the desired result using the [ ] and [ ] keys and press {

}. The controller asks for confirmation whether to proceed further. This is because; the entire result buffer gets overwritten due to this action. If you want to proceed further press {

}.

13.10.3.4. Controller will show result buffer, filled by the selected result details.

13.10.4. Edit & Delete the programmed steps:

13.10.4.1. Press [ ].

13.10.4.2. Select the desired program using the [ ] and [ ] keys and press {

}. This controller will display all the steps including their nominal values in that selected program.

13.10.4.3. To delete a step, select the required step & press { Delete }. The controller asks for confirmation before delete.

13.10.4.4. To edit a step, select the required step & press { Edit }. The Nominal value, Upper tolerance & Lower Tolerance values will be displayed for that step. Edit the selected value & Press [ENT] key to save the changes and exit.

13.10.4.5. Press [C] key to exit without saving any changes.

13.10.5. Statistical Analysis of the results:

13.10.5.1. Press [ ].

13.10.5.2. Select the desired program using the [ ] and [ ] keys and press { View }. This controller will display all the steps including their nominal values in that selected program.

13.10.5.3. Select the required step on which the statistical analysis is to be performed and press { Stats }. The controller will show the list of different statistical controls available. All the different options are explained below in detail.

13.10.5.4. Select the required option and press { Select }.

13.10.5.5. The controller will show the results of the selected statistical control. A graph (If available) can be viewed by pressing { Graph } key.

13.10.5.6. The results can be sent to the PC using the PC Utility and a report can be generated and printed using the PC Utility.

Following is the list of Statistical controls available:

Statistical controls	Description
Histogram (Range)	Histogram based on Range values
Histogram (Std. Dev)	Histogram based on standard deviation
Range Chart(MeasVal)	Range chart based on measured values
Sigma Chart(MeasVal)	Sigma Chart based on measured values
Mean Chart(MeasVal)	Mean chart based on measured values
Pareto Chart	Pareto Chart
Range Chart(Tol Val)	Range chart based on tolerance values
Sigma Chart(Tol Val)	Sigma chart based on tolerance values
Mean Chart(Tol Val)	Mean chart based on tolerance values

Memory:

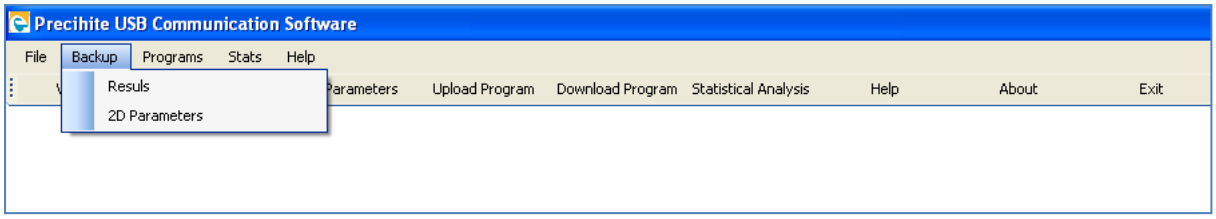
1. **Maximum Steps per program -- 200 Steps**
2. **Maximum Results per program -- 100 results**
3. **Maximum no. of programs -- 5 Nos.**
4. **Maximum Steps per 2 D -- 300 Steps**
5. **Maximum no. of 2 D buffers -- 10 Nos.**
6. **Maximum no. of Result memory -- 999 Nos.**

14. Report Generation using PC utility:

An application CD is provided along with the machine. This contains Software for communication with the EL100 controller through the USB port. Using this utility, the operator can backup / restore saved programs, backup result buffer, generate statistical analysis report, generate 2D measurement reports etc. Further, all these backup files can be viewed on the PC. User can export this file to excel by using “Export to Excel” button.

Following options are available for the operator:

14.1. **Backup of Result Buffer:** Backup of result buffer can be done by pressing “Results” as shown in the Fig.38.



On pressing the button, Fig. 38 the operator is prompted to enter a file name with “.DRO” extension. Press Open button to continue. The operator is again prompted to press “OK” to proceed downloading the data. The controller starts sending the result buffer data to the PC. The PC shows “Receive OK”. To View data on dialog box go to File menu select View file. Data will display as shown in Fig.39

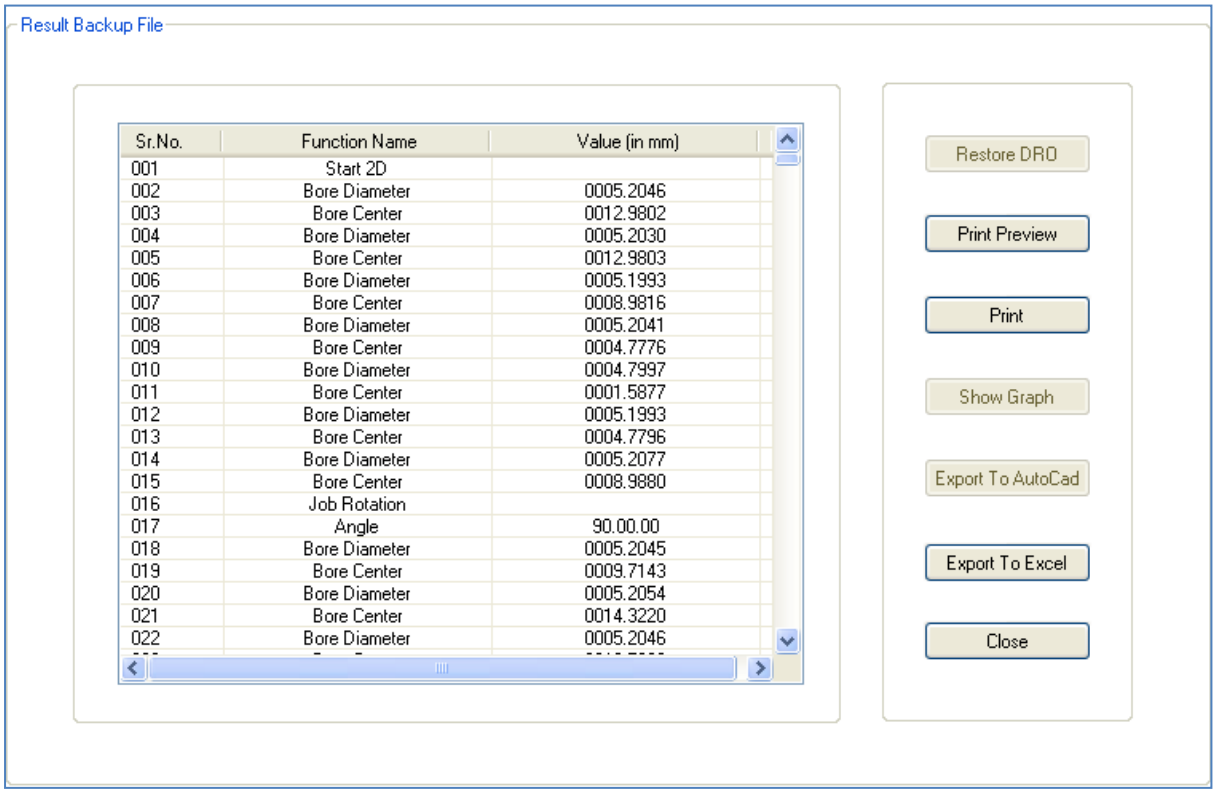


Fig. 39

The result data can then be printed using “Print ” button.

14.2. **Backup of stored programs:** This can be done using “Upload Programs” button as shown in the Fig.40.

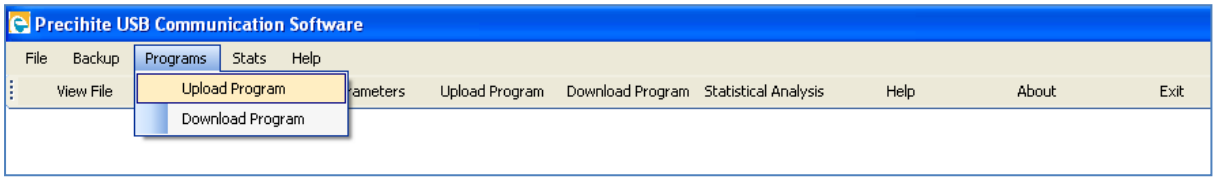


Fig. 40

Go to the stored programs list and navigate to the program which is to be downloaded. Then press the “Upload program” key. The controller will only respond to this command whenever the programs list is displayed. On pressing the button, the operator is prompted to enter a new file name with a “.DRO” extension. The controller starts sending the result buffer data to the PC. The PC shows “Receive OK” Dialog box after the data transfer is over. The saved programs files cannot be viewed on the PC screen.

14.3. **Download programs:** This can be done using “Download Program” button as shown in the Fig.41.

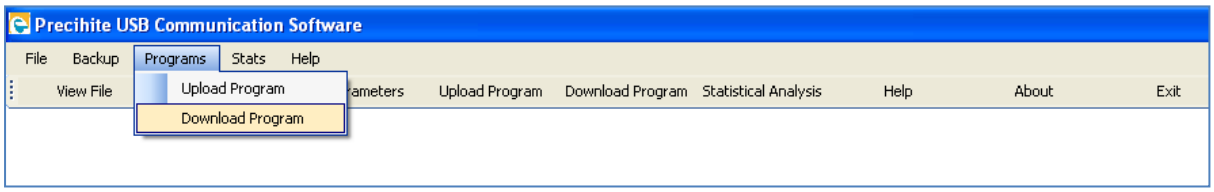


Fig. 41

The operator is prompted to select the required program file for downloading. The utility displays error message if the selected file is not a valid program file. Press “OK” to continue with restoring the selected program file. The program gets added in the programs list at the end. The controller will show error message if the programs list is full and cannot add new programs from PC.

14.4. **Generate statistical measurement report:** This can be done using “Statistical Analysis” button as shown in the Fig.42.

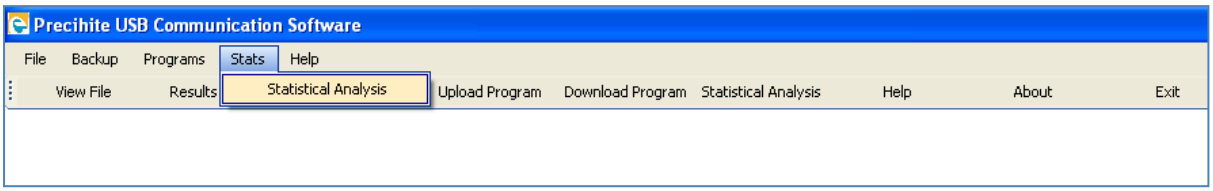


Fig. 42

The report can be generated only when the controller is showing the required statistical analysis data. All the statistical data which is shown on the controller display gets transferred to the PC which can be further printed. On pressing the statistical Analysis button, the operator is prompted to enter a file name with “DRO” extension for saving. All the data gets saved in this file which can be viewed later using “View Files” button. Press “OK” button to start uploading the data from controller. After completion of the upload, the utility shows “Receive OK” message box. And then will show the results of the Statistical measurement as shown in the Fig.43.

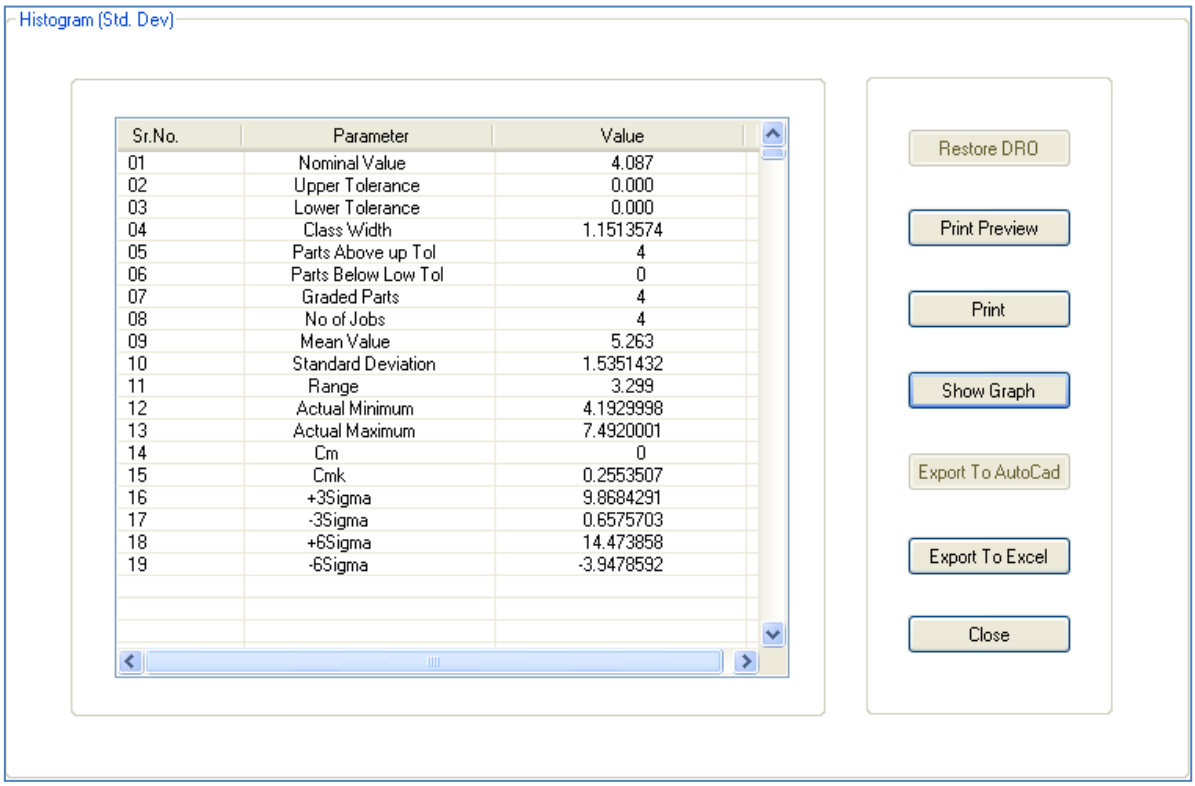


Fig. 43

If measurements are correct histogram and other statistical graphs can be seen using the “Show Graph” button. Graph shows number of jobs on Y-axis and Class numbers on X-axis.

The graph will be show as in Fig.44.

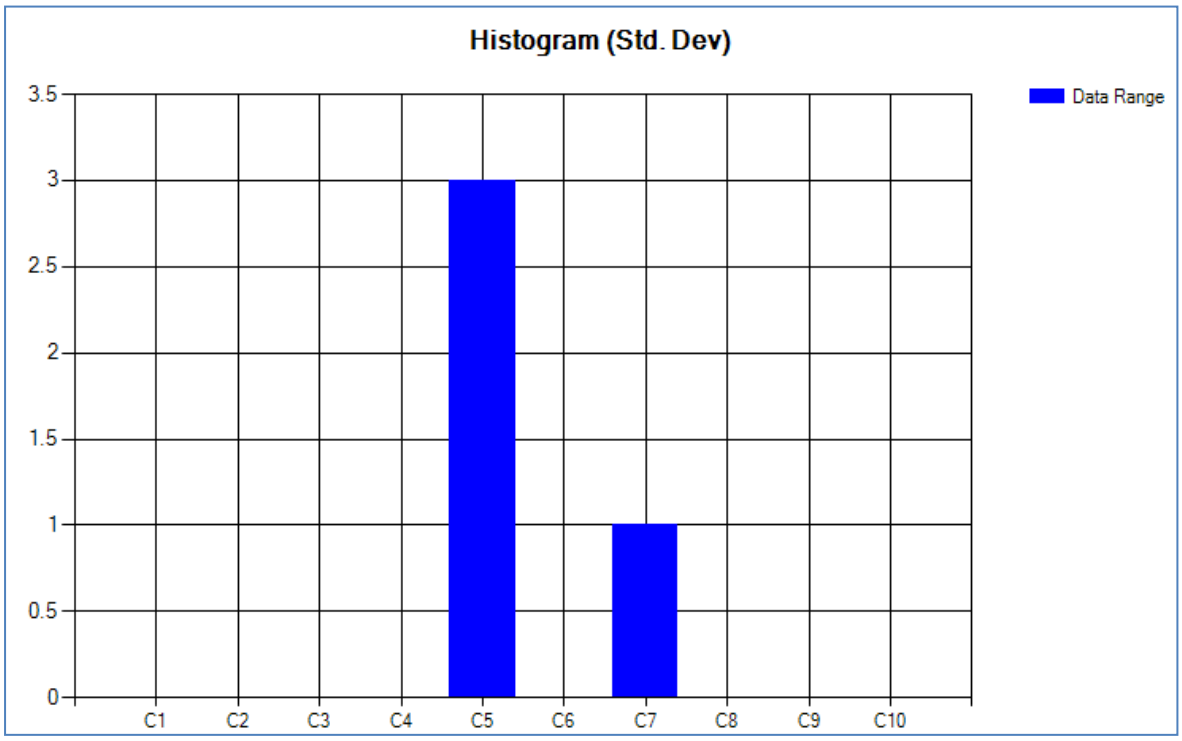


Fig. 44

14.5. **Generate 2D measurement report:** This can be done using "2D Parameters" button as shown in the Fig.45.

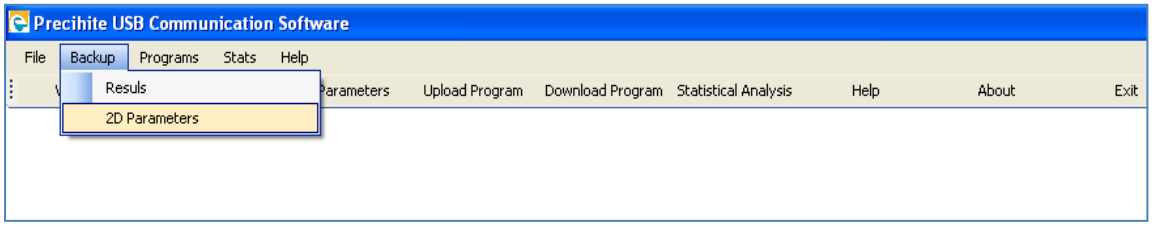


Fig. 45

The report can be generated only when the controller is showing the required 2D measurement Data i.e. when the operator has completed all the 2D measurements and applied all the different functions to the 2D table. All the 2D measurement data, which is shown on the controller display, are transferred to the PC which can be printed further. On pressing the "2D Parameters" button, the operator is prompted to enter a file name with "DRO" extension for saving. All the data gets saved in this file which can be viewed later using "View Files" button. Press "OK" button to start uploading the data from controller. After completion of the upload, the utility shows "Receive OK" message box. And then will show the results of the 2D measurements as shown in the Fig.46.

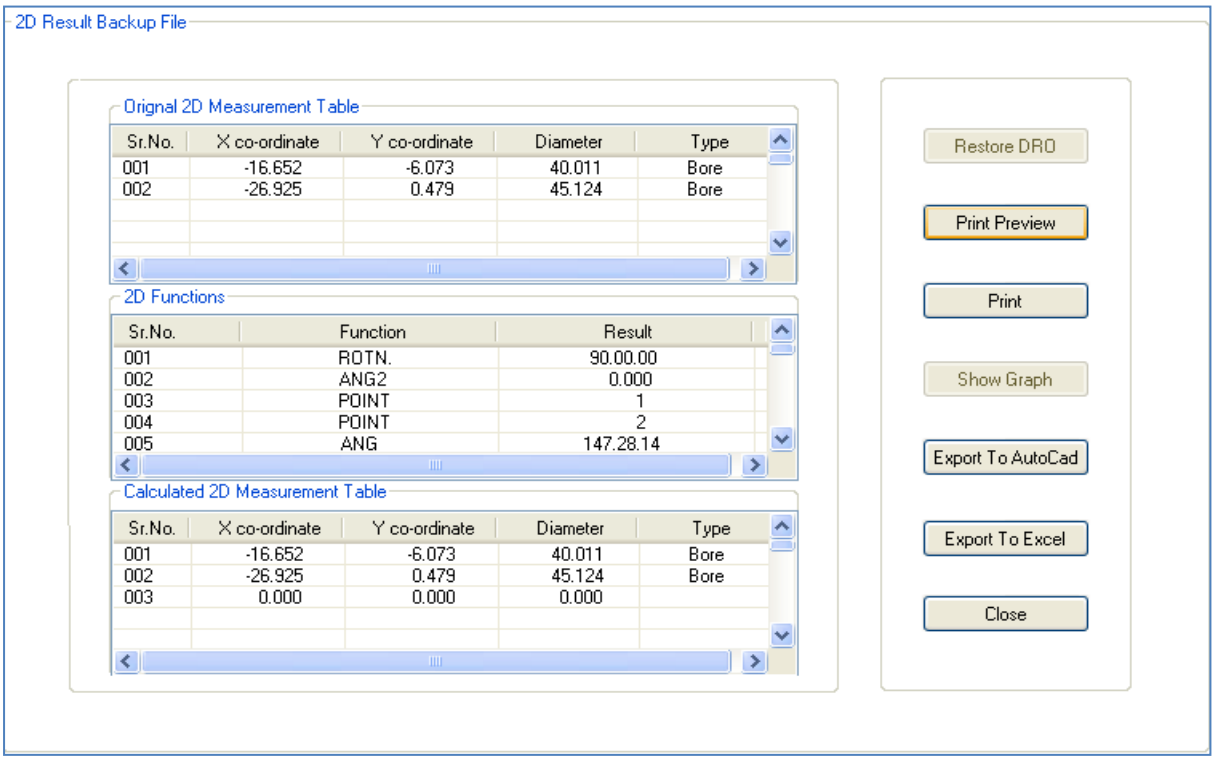


Fig. 46

2D results and function can export to Auto cad. Measured Bore, Shaft, Groove, Ledge as well as functions like PCD, Line, Distance, Angle are displayed on Auto cad with different colours.

2D Functions	colour
Bore/Shaft	While
Groove/Ledge	Blue
Line	Red
Distance	Green
Angle	Yellow

User should enter Auto-cad application path in “Path.txt” file as shown in Fig. 47. This file is present in Precihite application path.

Fig. 47

15. Tags Used in Result Buffer: Following table lists all the tags used in result buffer and their descriptions.

Tag	Description
LDGWID	Ledge width
LDGCEN	Ledge center
LDGTOP	Ledge top
LDGBOT	Ledge bottom
GRVWID	Groove width
GRVCEN	Groove center
GRVTOP	Groove top
GRVBOT	Groove bottom
SHFDIA	Shaft diameter
SHFCEN	Shaft center
BORDIA	Bore diameter
BORCEN	Bore center
BORBLW	Bore below
BORABV	Bore above
SHFBLW	Shaft below
SHFABV	Shaft above
CONBLW	Contact below
CONABV	Contact above
SQDIST	Squareness distance
SQDEV	Squareness deviation
SQINCL	Squareness inclination
SQRECT	Squareness rectilinearity
ANGLE	Angle results
MINIMA	Minimum result in MIN-MAX-DELTA function
MAXIMA	Maximum result in MIN-MAX-DELTA function
DELTA	Maximum minus minimum result in MIN-MAX-DELTA function (TIR)
START PROG	Start program tag
END PROG	End program tag
START REPLAY	Start replay tag
END REPLAY	End replay tag
NOM	Nominal value
UTL	Upper tolerance value
LTL	Lower tolerance value
DEV	Deviation from the nominal value

EXIT REPLAY	Exit replay tag
STRT2D	Start 2D function tag
FIN2D	Finish 2D function tag
JOBROT	Job rotation tag
ANG	Angle results
EXT2D	Exit 2D function tag
DATUM	Datum (On selected point) function tag
DATUM2	Datum (On entered coordinates) function tag
X	X coordinate
Y	Y coordinate
ALGX1	Alignment in X direction with datum and selected point
ALGX2	Alignment in X direction with two selected points
ALGY1	Alignment in Y direction with datum and selected point
ALGY2	Alignment in Y direction with two selected points
ALGXA	Alignment in X direction with entered angle
ALGYA	Alignment in Y direction with entered angle
ALGXCO	Alignment in X direction with datum and entered coordinates
ALGYCO	Alignment in Y direction with datum and entered coordinates
POINT	Selected Point in 2D table
PCD	Pitch Circle Diameter function in 2D
DIA	Diameter value
DMIN	Minimum Diameter value
DMAX	Maximum Diameter value
2DDIST	Distance function in 2D
DIST	Distance value
LINE	Line function in 2D
RECT	Rectilinearity value
ANG1	Angle function (type 1) in 2D
ANG2	Angle function (type 2) in 2D
ANG3	Angle function (type 3) in 2D
1DDIST	Distance function in 1D
OF ON	Offset function ON
OF OFF	Offset function OFF

XCEN	Center X coordinate
YCEN	Center Y coordinate
CENT	Center value in 1D
POLAR	Polar function in 2D
RAD	Radian value
REF	Reference tag
PRST_XL	Alignment in X direction with datum and selected point parallel to X Axis
PRST_YL	Alignment in Y direction with datum and selected point parallel to Y Axis
PRST_XC	Preset Coordinate X
PRST_YC	Preset Coordinate Y
PRST_XA	Preset Angle for alignment in X direction with datum and selected point
PRST_YA	Preset Angle for alignment in Y direction with datum and selected point

16. Printer Settings and Operations:

User can set printer in manual or automatic mode by selecting printing mode in user setup.

If user selected auto mode, { } key will disappeared and printer will print result automatically when operation completed.

16.1. Setting user information

User can set user name, job name and company name by

1. In Setup Mode, Select “Edit User Info”.
2. Press { } key for editing user Information.
3. Enter name or no’s from keypad.
4. Press { } key.
5. After pressing Enter key it will save the user information.

Controller will print this user information before data printing.

16.2. Printing different operations

16.2.1. Print Result Buffer:

User can print All or Selected data from result buffer. To print result buffer Press { } key.

1. { } Key: Will print all data present in result buffer.

2. { } Key: User can print selected data. Select starting and ending results using select key. Controller will directly give the print command after selecting ending result. If user have selected auto mode user cannot give selective printing.

16.2.2. Print SPC data and graphs.

1. Press [ ] key.
2. Press { } key.

3. Select which part of program you want to print.
4. Press {

} key.
5. Press {

} key to select which statistical data you want to see or print.
6. Press {

} key to print data and graph of the same statistical data.

16.2.3. Print Squareness data.

After completing squareness operation user can directly give print by pressing { } key.

17. Serial Port Settings:

Serial port / RS232 signal details for EL100 described below.

Connector 9 pin D Male

Pin no.	Signal
1	--
2	RXD
3	TXD
4	DSR (V+ in case of Digital Dial)
5	GND
6	--
7	--
8	--
9	--

User can set serial port setting from user setup mode.

Baud Rate	4800, 9600, 19200, 38400, 57600, 115200
Parity	No, Even, Odd
Number of data bits	7, 8
Number of stop bits	1, 2

Data can either be printed on serial port by connecting a serial printer directly to the port or be captured on a PC using any standard terminal software available.

The serial port settings mentioned above should match with either a serial printer or the terminal software.

18. Application Examples:

Example 1: Determining height and width measurements of a test-piece.

Consider the following test piece. The aim is to measure all the dimensions as shown in the Fig.48.

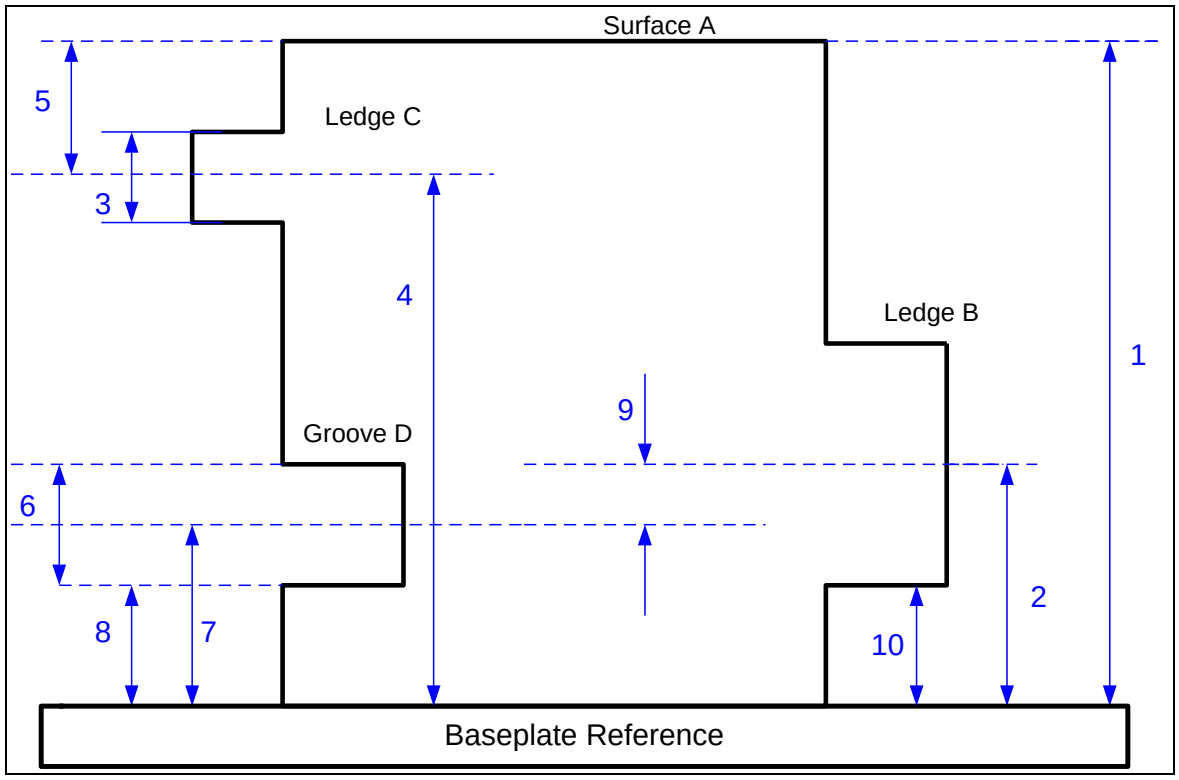


Fig. 48

Dimension 1: Adjust the probe above the Surface ‘A’ and press [ ]. The required result will be displayed on the screen as “CONABV”.

Dimension 2 and 10: Adjust the probe below the Ledge B and press [ ]. The machine will probe the ledge from below and wait for the [ ] key. Adjust the probe above the ledge and press [ ]. The controller will display required center and the height of bottom surface as “LDGCEN” and “LDGBOT”.

Dimension 3 and 4: Adjust the probe below the ledge C and press [ ] key. The machine will probe the ledge from below and wait for the [ ] key. Adjust the probe above the ledge and press [ ]. The controller will display required center and width as “LDGCEN” and “LDGWID”.

Dimension 5: To determine this dimension press { } key. The controller will prompt for the selection of first result from result buffer. Scroll using [ ] and [ ] keys and select dimension 1 using [ ] key. The controller will prompt to select the second result. Scroll to dimension 4 and press { } key. The controller will calculate the difference between the 2 results and will display the result. Thus dimension 5 will displayed.

Dimension 6, 7 and 8: Adjust the probe inside the Groove D and press [ ] key. The machine will probe the groove from below and above and will display required center, width and bottom height as “GRVCEN”, “GRVWID” and “GRVBOT”.

Dimension 9: Press { } and select dimension 2 and 7 using the [ ], [ ] and [ ] keys. The controller will calculate the difference and display. Thus dimension 9 gets displayed and is added in the result buffer.

Example 2: Determining the Flatness error of a test-piece.

The flatness error of a test-piece can be determined by the following procedure.

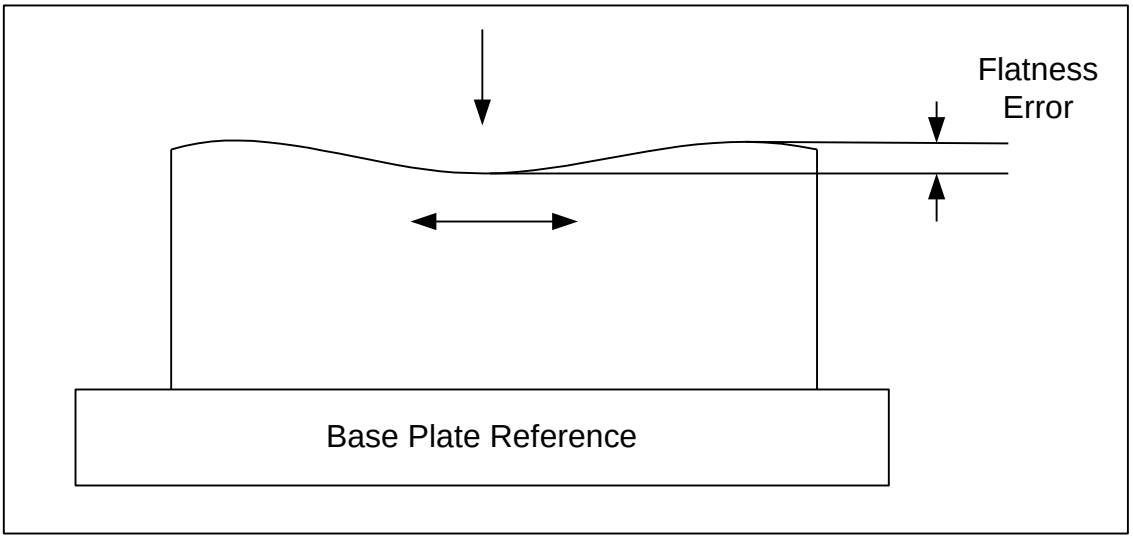


Fig. 49

1. Clamp a cylindrical probe in probe holder and position it shortly above the test-piece.
2. Press { } key.
3. Select direction by pressing { } or { } key.
4. The controller will start searching the surface in that direction. On touching the surface the controller starts scanning the minimum distance and maximum distance on the test-piece.
5. Move the test-piece as shown in the diagram.
6. On complete scan of the test-piece, press {

}. The results can be toggled using the [

] key. The controller toggles between “MIN”, “MAX”, and “DLT”.
7. The difference between “MIN” and “MAX” is given by “DLT” which is the flatness error of the test-piece.

19. Maintenance and Care:

ALL MAINTENANCE WORK APART FROM DESCRIBED BELOW WILL BE CARRIED OUT EXCLUSIVELY BY AUTHORISED PRECIHITE DEALER.

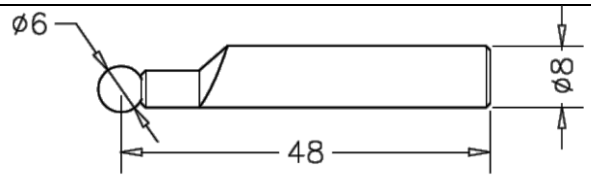
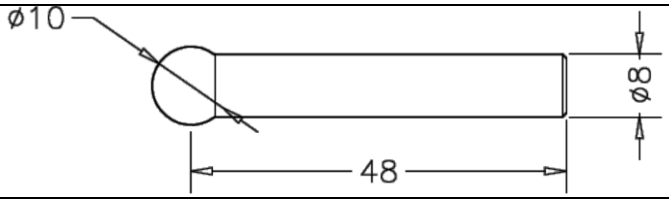
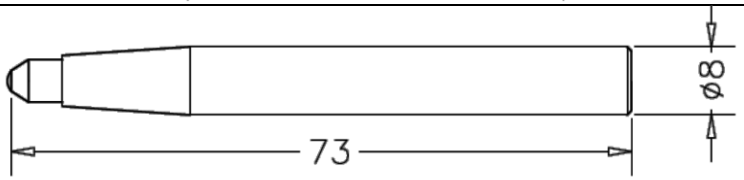
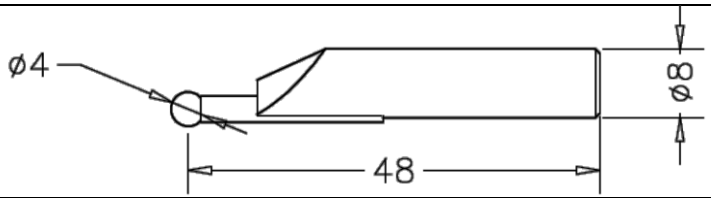
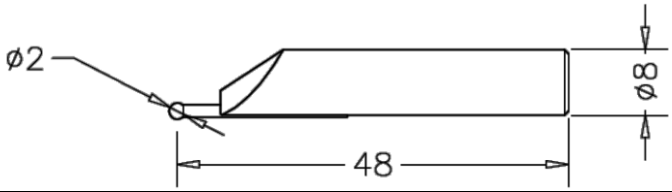
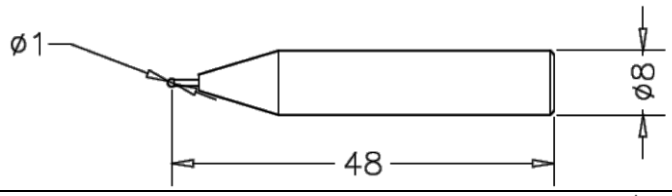
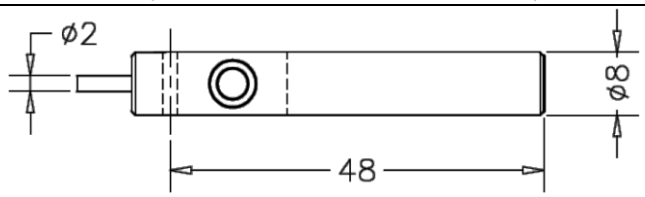
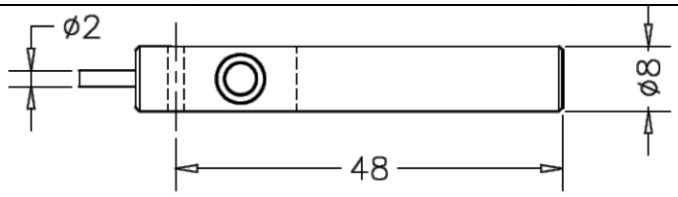
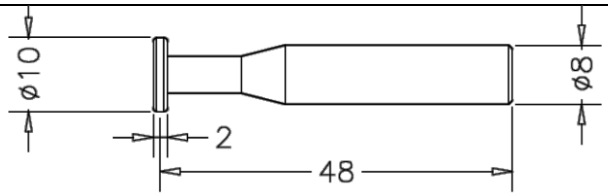
1. Clean the surface plate and air cushioning pads periodically. Use soft and clean fabric soaked with alcohol for cleaning.
2. All probes should be kept in a Probe Box after use to avoid any type of Damage.
3. If the instrument is not in use, enclose it with dust cover.
4. Apply antirust spray/oil on super finished faces of setting master when not in use.
5. Precihite consists of a rechargeable battery.
    - Battery status indication is provided on the controller unit.
    - If it shows empty battery indication battery charging is essential.
    - Battery charging device (mains AC adaptor) is included in standard scope of supply.
    - To charge batteries connect a charging AC adaptor to the controller unit at corresponding socket. Switch on the mains supply.
    - Charging will be displayed by blinking indication on the controller unit screen.
    - It takes approximately consecutive 4 hrs. to charge a discharged battery.
    - Do not use any other device to recharge the battery.
    - **REMOVE OR SWITCH OFF AC ADAPTOR AFTER COMPLETION OF EVERY CHARGING.**
    - **TO IMPROVE BATTERY LIFE, AVOID BATTERY CHARGING AT INTERMEDIATE LEVEL BEFORE IT GETS COMPLETELY DISCHARGED.**
6. The outer body of the instrument can be cleaned with slightly moistened fabric. Do not clean any part of the instrument with harsh chemicals like acetone or detergents.
7. Do not connect or disconnect any connector from controller unit when the instrument is in “Switched ON” condition. This may damage controller unit or electronic /electrical components.

20. Optional Accessories:

20.1 Option A (HEMA-02-0010)

Code	Probe	Type
HEMA-02-0030	Carbide ball probe ϕ 10mm x 48mm	Concentric
HEMA-02-0190	Depth probe 73mm	Std. Depth
HEMA-02-0070	Carbide ball probe ϕ 4mm x 48mm	Eccentric
HEMA-02-0100	Ruby ball probe ϕ 2mm x 48mm	Eccentric
HEMA-02-0120	Ruby ball probe ϕ 1mm x 48mm	Concentric
HEMA-02-0140	Steel pin probe ϕ 2mm for thread measurement	Pin ϕ 2mm
HEMA-02-0150	Carbide pin probe For groove & thread Pin ϕ 2mm x 48mm	Multi use
HEMA-02-0200	Disc probe ϕ 10mm x 48mm	

- All these probes are packed in a wooden box.

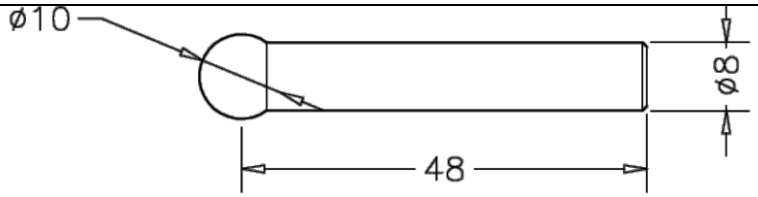
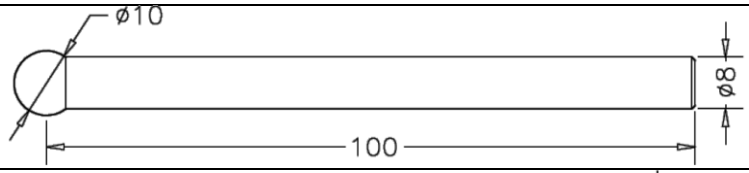
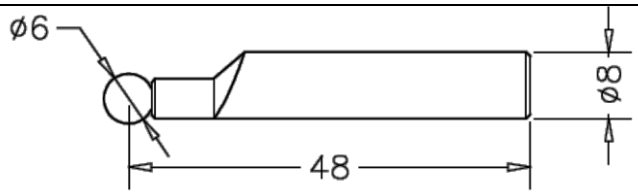
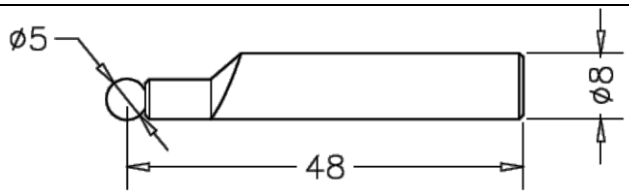
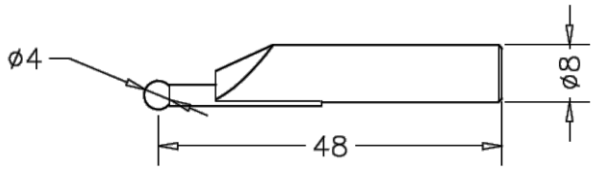
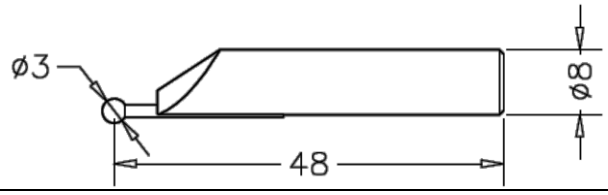
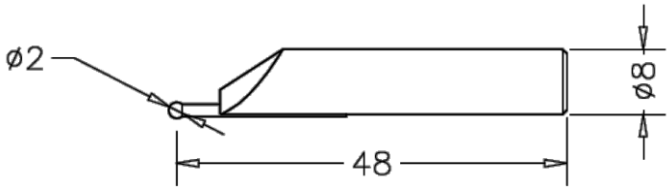
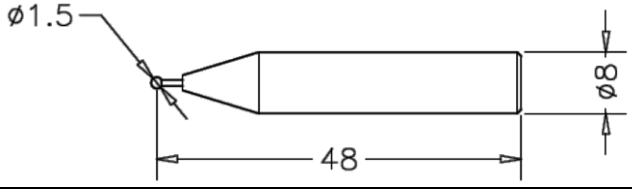
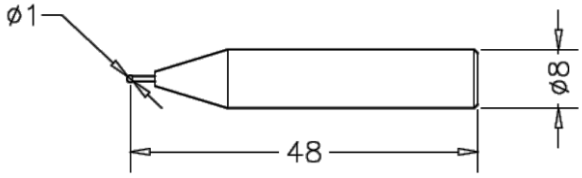
	Standard Probe
	HEMA-02-0030
	HEMA-02-0190
	HEMA-02-0070
	HEMA-02-0100
	HEMA-02-0120
	HEMA-02-0140
	HEMA-02-0150
	HEMA-02-0200

- All Dimensions in mm

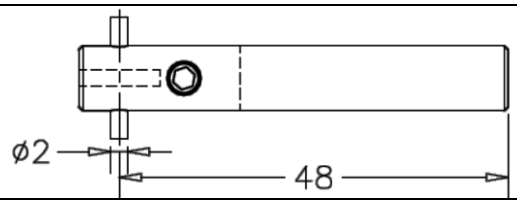
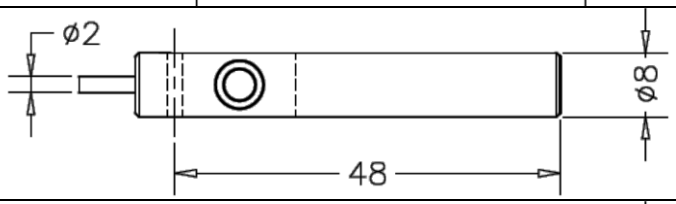
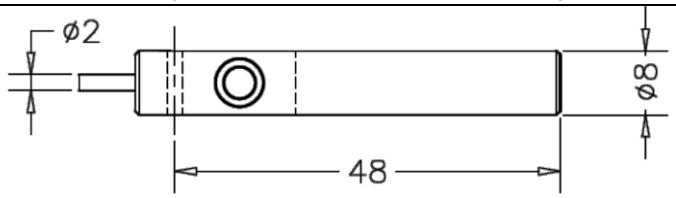
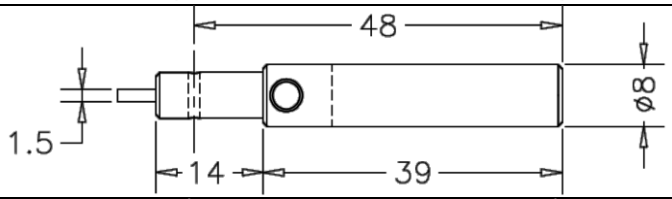
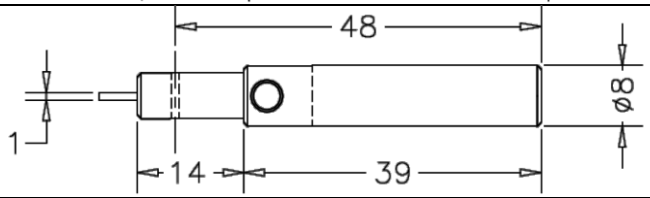
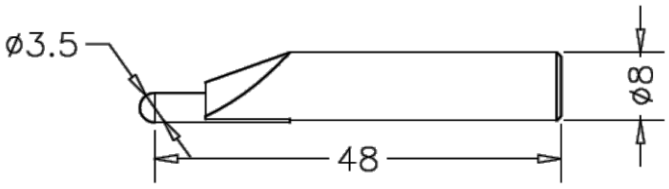
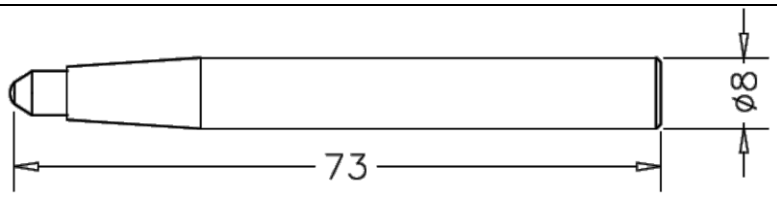
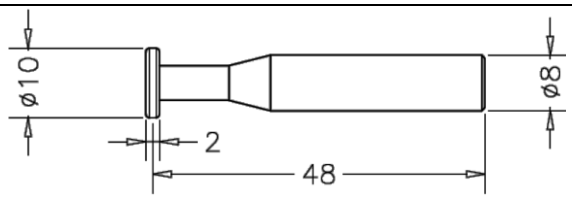
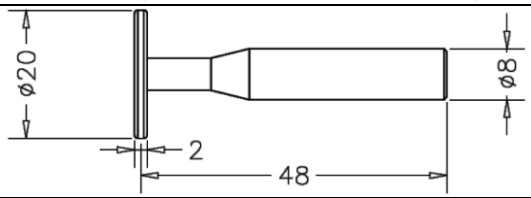
20.2 Option B (HEMA-02-0020)

Code	Probe	Type
HEMA-02-0030	Carbide ball probe ϕ 10mm x 48mm	Concentric
HEMA-02-0040	Carbide ball probe ϕ10mm x 100mm	Concentric
HEMA-02-0050	Ruby ball probe ϕ 6 mmx 48mm	Eccentric
HEMA-02-0060	Ruby ball probe ϕ 5mm x 48mm	Eccentric
HEMA-02-0070	Carbide ball probe ϕ 4mm x 48mm	Eccentric
HEMA-02-0090	Ruby ball probe ϕ 3mm x 48mm	Eccentric
HEMA-02-0100	Ruby ball probe ϕ 2mm x 48mm	Eccentric
HEMA-02-0110	Ruby ball probe ϕ 1.5 mmx 48mm	Concentric
HEMA-02-0120	Ruby ball probe ϕ 1mm x 48mm	Concentric
HEMA-02-0130	Steel Pin Probe ϕ 2 mm For Groove	PIN ϕ 2
HEMA-02-0140	Steel pin probe ϕ 2 mm For thread	Pin ϕ 2
HEMA-02-0150	Carbide pin probe For groove & thread Pin ϕ 2.0 mm x 48 mm	Multi use
HEMA-02-0160	Carbide pin probe For groove & thread Pin ϕ 1.5 mm x 48 mm	Multi use
HEMA-02-0170	Carbide pin probe For groove & thread Pin ϕ 1.0 mm x 48 mm	Multi use
HEMA-02-0180	Carbide pin probe For sheet metal Pin ϕ 3.5 mm x 48 mm	Pin type
HEMA-02-0190	Depth probe 73mm	Std depth
HEMA-02-0200	Disc probe ϕ 10mm x 48 mm	
HEMA-02-0210	Disc probe ϕ 20mm x 48 mm	

- All these probes are packed in a wooden box.

	HEMA-02-0030
	HEMA-02-0040
	HEMA-02-0050
	HEMA-02-0060
	HEMA-02-0070
	HEMA-02-0090
	HEMA-02-0100
	HEMA-02-0110
	HEMA-02-0120

- All Dimensions in mm

	HEMA-02-0130
	HEMA-02-0140
	HEMA-02-0150
	HEMA-02-0160
	HEMA-02-0170
	HEMA-02-0180
	HEMA-02-0190
	HEMA-02-0200
	HEMA-02-0210

- All Dimensions in mm

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